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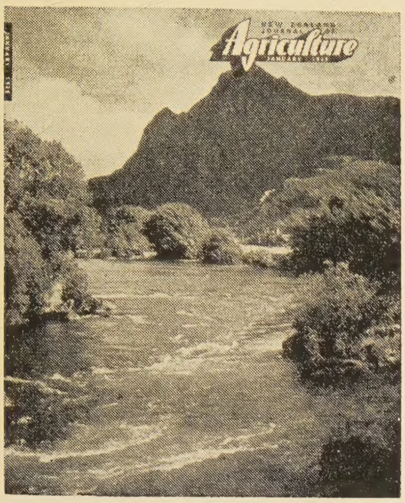

Hydro-electric power development is rapidly changing the upper part of the Waikato River into a chain of lakes that eventually will provide many square miles of placid water ideal for boating, swimming, and fishing. The transformation has already stilled long reaches of turbulent water such as that shown on our cover, which has now been obliterated by the lake which rises behind Whakamaru Dam. Hydro-electric construction has been paralleled by large-scale development of land bordering the upper river and stretching across the extensive pumice belt to beyond Rotorua and Taupo. The launching of two major enterprises for the production of paper, other wood pulp products, and timber from the immense planted exotic stands has added to the remarkable industrial and agricultural expansion on the Central Plateau.

[D. R. Brenchley photo

CONTENTS

20th Grassland Conference Visits Otago .. 2
Meteorological Records for November .. 5
Soil Surveys .. H. S. Gibbs .. 9
Code for Dairy Farmers with Approved Standard Technique for Cleaning Plant and Equipment .. 14
Domestic Beekeeping .. D. A. Briscoe .. 15
Organisation of Pollination Service for Farm Seed Industry .. T. Palmer-Jones .. 17
Weed Identification and Control: Tall Fescue .. D. I. Glue and L. J. Matthews .. 24
Control of Grass-grub on Pastures .. A. V. Allo .. 25
Radio Broadcasts .. 28
Vitamin Requirements of Poultry and Deficiency Disorders .. J. Edmondson .. 29
Dates of Wool Sales and Ram Fairs .. 32
Storage Dam for Pump Irrigation Water .. W. A. Lunn .. 33
Care of Livestock during February .. 34
Seed for New Pastures: Lucerne for Grazing (Seasonal Notes) .. 35
Mange in Pigs .. G. A. Durham .. 36
Fire Protection for Farm Homes and Buildings .. G. Dunnachie .. 37
Raising the Lambing Percentage of Sheep .. I. J. Inkster .. 41
Recent Research Work: Potash and Spring Application of Nitrogen on Irrigated Pastures .. J. Lammerink .. 44
The Home Garden .. A. G. Kennelly .. 45
Levin Horticultural Research Station .. 55
Lucerne Irrigation Trial at Winchmore .. B. A. Lauder .. 57
Common Plants Poisonous to Stock .. M. R. Coup .. 61
A. and P. Show Dates .. 69
History of Fruitgrowing in Nelson .. N. J. Adamson .. 70
A New-type Electric Steam Generator for Honeycomb Uncapping Knife .. C. R. Paterson .. 83
Using Cucumbers .. Christine Lyons .. 87
The Flower Garden .. K. H. Marcussen and Rosalie A. Campion 92
A Useful Plastic Skirt .. Eleanor S. Campbell .. 102
Success with Cake Baking .. Judith Ferrier .. 103

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20th GRASSLAND CONFERENCE VISITS OTAGO

▲ Attendance at the field day on some of the 400 acres of undulating second-class land of the 1,300-acre Invermay Research Station. In the background is some of the 700 acres of ridgy third-class soil, about 400 acres of which has been reclaimed from gorse and scrub, mainly by use of the swamp plough. About 200 acres of the Station is flat, fertile alluvial soils. Trials with most of the recognised nutrient elements have been carried out on the second- and third-class soils since the Station was taken over by the Department of Agriculture 9 years ago. Increases in dry matter production from plots treated with 2 oz. per acre of molybdenum once only have been as high as 280 per cent. This minor element has been the key to improvement of many millions of acres of similar "marginal" soils by making them responsive to phosphate and therefore easily improvable.

FOR its 20th annual conference in Dunedin in November last the New Zealand Grassland Association arranged a programme of papers and field visits that comprehensively filled in the picture of advances in soil fertility building and land development practices in Otago since the only previous conference in Dunedin (the 6th) was held 21 years ago.

The very appreciable production increases that are being attained by the combined efforts of the scientist, the extension officer, and the progressive farmer provided a wide field of discussion, and there were many indications of the ample scope for continued improvement.

FIELD day inspections of land development on tussock grassland and previously cropped-out reverted areas and of projects at the Invermay Research Station presented the practical side of methods that are transforming the pastoral scene in large parts of Otago and other areas of the South Island.

PRODUCTION figures for the Otago Land District emphasise the increased tempo in recent years of the revolution in land usage that has been made possible by the rapid accretion of new knowledge which enables the re-establishment of much depleted and reverted country and the correction of fertility problems. "The frontiers of grassland improvement", according to an outstanding paper on marginal areas, "have moved from the plains and downs to the hills and mountains; from the small paddock to the range; from the accessible to the remote; and this has been assisted by many factors, not the least of which is the aeroplane".

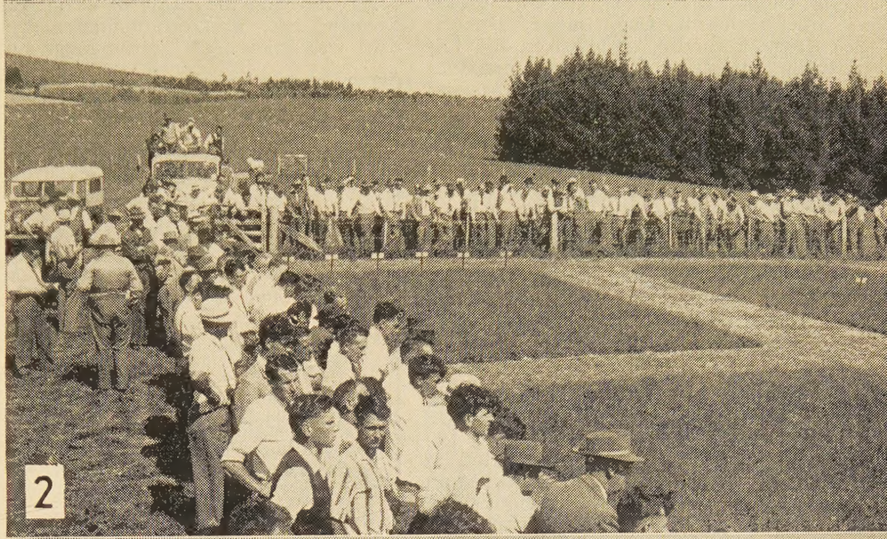
Tenor of a symposium of papers on soil fertility and land development was continued improvement of pasture species and knowledge of their requirements and management, with lifting of the habitat to carry a high-producing sward rather than seeking lower-producing species suited to an inferior habitat. Some outstanding examples of increased carrying capacity and improvement in the health and quality of stock and in the cover and health of introduced and native pasture species were quoted as an indication of the influence widespread application of new techniques

1. Land development on country → that reverted to manuka after over-cropping with cereals up to about the 1920s. The area shown is being brought in by conventional methods of ploughing with heavy swamp ploughs, cultivation, liming at 30 cwt. per acre, and ridging of swedes at 11 to 13 oz. per acre with 3 to 4 cwt. of molybdenised reverted superphosphate or turnip mixture. If it is sown to pasture without the preliminary root crop, the roller drill is used with 22 to 24 lb. of a pasture mixture and 3 cwt. of molybdenised superphosphate per acre. Development costs are between £22 and £24 per acre.

2. At one of several plot trial demonstration points on the Invermay Research Station at which results of pasture establishment and improvement techniques were discussed by Station staff.

3. Part of a 3,000-acre reverted country development project. About 400 acres is worked each year. Ploughing is completed as early as possible in autumn and is followed by discing in winter and liming. Much of the success with swedes and turnips is due to the excellent cultivation. About 60 acres is sown in a root crop and the rest to permanent pasture. Part of the 20,000-acre "Traquair" property visited in the morning of the field day lies on the hill slopes at right background of the illustration.

4. A group at the field day at the "Traquair" property, which by introduction of clovers and fertility build-up by stock grazing has in an improvement programme begun in 1951 been converted from a store stock run proposition to one that produces first-class wool and fat stock. Left to right—Mr R. J. Reid ("Traquair"), Mr H. A. Duff (formerly Department of Agriculture, who as an instructor played a prominent part in encouraging tussock and scrubland improvement in Otago), Dr L. Corkill, immediate past president of the Grassland Association, Mr K. W. Reid ("Traquair"), and Mr A. G. Elliott, Fields Superintendent, Department of Agriculture, Dunedin.



could have on the economy of the South Island.

Evolution of Otago Farming

With its more than 8 million acres of occupied land extending from the intensively farmed alluvial plains at sea level to the summer grazed natural grasslands at altitudes of over 5,000 ft., the Otago Land District provides the greatest variations in climate, topography, and soil types. In a review of the evolution of the farming pattern in Otago, Mr A. G. Elliott, Fields Superintendent, Department of Agriculture, Dunedin, emphasised the following points as having an important effect on the subsequent grassland production of the district:

1. The laying waste of many acres of land by the various methods of goldmining.
2. The over-burning and over-grazing of natural vegetation which had adapted itself to a set of particularly rigorous conditions.
3. The depletion of early developed areas by over-cropping of grain crops.
4. The introduction of rabbits, which soon overran enormous areas of the tussock regions, thence extending to the adjacent farmlands.

"Of the many ventures initiated in Otago to have tremendous influence on grassland farming throughout the Dominion, probably the two outstanding projects were the introduction of the frozen meat industry and the processing of artificial fertilisers", said Mr Elliott. "The development of these ancillary industries changed the whole farming programme, giving enhanced value to pasture production. . . ."

The grassland farmers of Otago had developed the coastal plains and rolling hills from the original bush, tussock, and scrub to a high level of pasture production in which fat lamb, beef, dairying, and small seeds were allied with supplementary feed and cash crops.

"On the lower rainfall inland areas dryland farming in which lucerne and lucerne-grass mixtures are the key producers is successfully practised, while over 65,000 acres under State irrigation schemes and more than 10,000 acres under private irrigation contribute greatly to total grassland production. . . . Development of appreciable areas of cut-over bush country and drainage of swamp areas have added to total returns."

High-country Grassland Research

Trials with pasture species to investigate the possibility of improving the deteriorating natural swards of Central Otago were reported as early as 1900 and the establishment of a series of trial plots and study of the vegetative cover of the Dunstan Range and other areas by the late Dr L. Cockayne initiated research into high-country grasslands.

Interest in the re-establishment and efficient management of high-country grasslands was intensified by the accelerated man-made erosion resulting from goldmining methods, loss of natural cover by over-burning and hard grazing by the rapidly increasing rabbit population, and the combined effect of these factors on run-off and flooding in lower river catchments.

By the time the value of aerial top-dressing had been established a great deal was known about the most suitable pasture species and fertilisers for the problem areas.

Papers and Speakers

Opening address: Sir Charles Hercus

Presidential address: Dr L. Corkill

Farming in Otago: A. G. Elliott

Soils of Otago: Their Problems and Potential: J. D. Raeside

Pastures and Soil Fertility: Dr P. D. Sears

The Improvement of Foothill Country: W. R. Lobb

Pasture Improvement at Invermay: G. A. Holmes

Pasture Improvement in Low Altitude Snow Tussock and Scrubland: H. A. Duff

Farm Shelter for Exposed Rolling Country of Otago: C. H. Brown

Economics of Land Development in Otago: N. M. Peryman

Methods of Manufacture and Control of Legume Inoculants Prepared in New Zealand: J. R. Callaghan

Effect of Management on Pasture Composition: S. Maclean

Pasture Establishment Studies at Invermay Research Station: N. A. Cullen

Printed "Proceedings" of the conference, which include all papers, summaries of discussions, and field day addresses, may be ordered at 15s. per copy from the Secretary to the New Zealand Grassland Association, Box 2298, Wellington.

"Obviously", said Mr Elliott, "little of lasting value could be attempted until control of rabbits was effected, and the outstanding contribution to progress in Otago by those whose foresight and enthusiasm resulted in the formation of rabbit boards with the 'killer policy' must be fully recognised.

"While there remain many problems to be overcome before the most suitable species can be established and maintained on the tussock grassland areas, the important fact is that there is realisation that the application of new methods of management and the use of native and introduced species will be both practical and economical.

Agricultural Research Projects

"On the cultivable areas research projects involving a wide range of cultivation practices, pasture species, fertilisers, management techniques, as well as silage and hay, have all contributed to pasture production and increased returns. New techniques in land development, by conventional methods involving deep ploughing, fallowing, liming to requirement, followed by a feed crop before sowing in permanent pasture, surface seeding by special equipment into native or reverted swards, and also the more rapid establishment of a temporary type pasture by aerial sowing have all been investigated and are being successfully adopted."

The work on trace elements, said Mr Elliott, was of special importance. The first field trials with molybdenum were started in the Outram hill country and later extended to the Invermay Research Station and to a wide range of farming country throughout the Dominion. Field trials with other trace elements were already yielding valuable results and other investigations were proceeding.

Correction of Mineral Deficiencies

The important role of some of these elements in the improvement of foothill country was the theme of a paper by Mr W. R. Lobb, Assistant Fields Superintendent, Department of Agriculture, Christchurch, in which he showed that the development of these marginal areas was entirely dependent on the correction of the mineral deficiencies which limit nitrogen fixation by the legume plant; that nothing spectacular was likely to be done without this step; and that other avenues of approach were bound to be limited because of the very limits imposed by these deficiencies on any of the other steps likely to be taken.

A fair portion of the two-thirds of the occupied area of Canterbury and Otago that was unimproved grassland could be brought to high production by study of this fertility problem. The unimproved areas with this demonstrable potential were not all foothills, or mountains, or plains; there were numerous areas of each, said Mr Lobb. Irrespective of size, slope, or altitude they were extensively farmed, generally at a low level of efficiency, and their improvement depended on the correction of some fertility problem.

Only in comparatively recent times had any real interest been shown in the development of these areas, yet the factors fundamental to their improvement were little different from those in the practices used on the so-called heavy fertile developed areas for 30 or 40 years; simply the use of fertilisers and the legume plant.

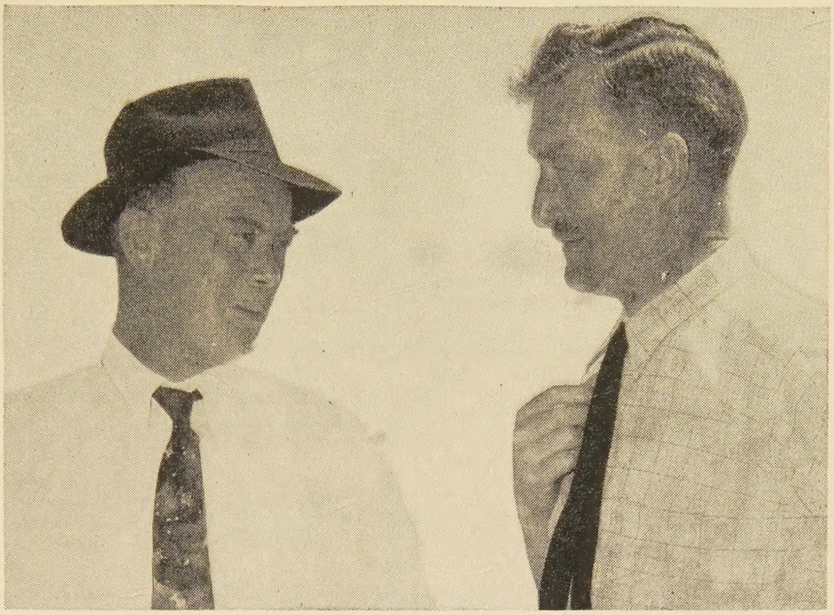
"There is little doubt that impetus to practical application was given by a more critical study of fertiliser and lime effects aimed at reducing the cost of improving marginal land", said Mr Lobb. "This was high-lighted by the advent of molybdenum and more recently of sulphur."

The fertility problems of the foothills began to take shape in Otago, where molybdenum was first used and where began the development based on the heavy use of lime and superphosphate coupled with cultivation, critical examination of which led to methods which have modified lime usage to an unbelievable degree, led to critical study of phosphate responses, and eliminated cultivation as essential to clover establishment. Critical study of inoculation problems in Otago might be significant beginnings of a much greater development. From the northern part of Otago the importance of sulphur deficiencies emerged and the same area played its part in the introduction of aerial oversowing and winter sowing of clover seed on a completely unprepared seedbed.

"There can be no doubt", said Mr Lobb, "that measured purely in terms of potential ability to produce, many of the unimproved areas could be highly productive. . . . In their unimproved state much of the tussock grasslands intermingled with the browntop and danthonia country has a coverage of plants that carries somewhere between one sheep to 5 acres or more and one sheep per acre. In all these areas all the stock are underfed all the time.

"By the introduction of clovers and by correcting fertility, a 25-fold increase in measured production has been made on some of these areas. This would put their potential at 4 to 5 sheep per acre instead of the 4 to 5 acres per sheep.

"It may be absurd to suggest that this is so of much of the area, but it is true to say that very substantial improvement in both nutritional levels (as reflected in wool weights, lamb percentages, and decreased losses) and carrying capacity is possible over a large portion of it."



Dr P. D. Sears (left), Director, Grasslands Division, Department of Scientific and Industrial Research, elected vice-president of the Grassland Association, and Mr G. A. Holmes (right), Superintendent, Invermay Research Station.

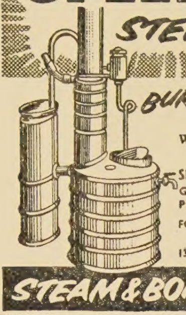
Intensive Grassland Farming

The greater proportion of the almost doubled production of the main lines of pastoral production that had been achieved since the Grassland Associa-

Meteorological Records for November

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in Inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	240	62.0	+ 2.9	76.8	43.2	1.14	10	— 2.70	0.45	3	236
Auckland	160	62.7	+ 2.3	75.9	46.9	2.31	11	— 0.99	0.60	24	218
Tauranga	12	60.1	+ 1.3	77.0	38.6	5.04	11	+ 1.60	1.50	9	254
Ruakura	131	59.4	+ 2.0	73.3	38.8	4.49	10	+ 0.81	2.04	3	243
Whakarewarewa	1006	58.7	+ 2.3	78.2	36.9	5.06	11	+ 0.91	1.56	1	200
Gisborne	12	60.8	+ 1.8	81.1	38.6	2.08	10	— 0.51	0.91	27	239
New Plymouth	160	59.6	+ 2.8	73.4	41.2	5.35	10	+ 0.64	1.14	16	234
Karioi	2125	54.2	+ 2.3	75.6	29.0	3.13	9	— 0.73	1.13	4	
Napier	5	61.7	+ 2.1	84.2	41.3	1.87	9	— 0.22	0.41	1	251
Wanganui	72	59.6	+ 1.4	74.6	40.2	0.85	8	— 1.77	0.40	16	233
Palmerston North	110	59.4	+ 2.5	76.6	35.0	1.31	9	— 1.56	0.36	16	205
Waingawa	340	58.2	+ 2.1	85.0	33.0	1.93	7	— 0.77	1.52	27	274
Wellington	415	57.4	+ 1.6	72.9	41.2	0.86	7	— 2.51	0.27	17	253
Nelson airfield	5	57.0	+ 1.5	81.2	37.8	0.44	7	— 2.29	0.22	15	276
Blenheim	12	58.8	+ 1.9	81.5	33.8	0.73	4	— 0.98	0.23	15, 17	293
Hokitika	15	55.3	+ 1.5	66.2	39.6	6.04	14	— 3.89	1.62	15	181
Hanmer	1270	56.3	+ 2.5	85.0	29.0	1.48	9	— 2.00	0.50	27	243
Christchurch	22	59.5	+ 3.2	86.0	34.9	0.40	4	— 1.42	0.18	16	244
Ashburton	323	60.6	+ 4.9	92.8	33.8	1.07	9	— 1.38	0.27	27	241
Timaru	56	60.5	+ 5.0	89.4	38.1	1.26	8	— 0.69	0.48	6	234
Alexandra	520	60.0	+ 3.6	89.0	34.1	0.76	5	— 0.32	0.33	30	207
Taieri	80	55.8	+ 2.4	81.2	33.9	2.29	11	+ 0.01	0.98	16	185
Invercargill airfield	0	54.2	+ 2.4	78.9	35.6	2.34	15	— 1.30	0.73	29	157
Chatham Islands	140	53.8	+ 1.8	66.0	37.9	0.52	3	— 1.71	0.32	3	

Mr W. R. Lobb, Assistant Fields Superintendent, Department of Agriculture, Christchurch, whose paper reviewed the production increases arising from correction of mineral deficiencies over a wide range of "marginal" areas and pointed the way to continued improvement.



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tion was formed 27 years ago had occurred on cultivated pasture land as the result of adoption of more intensive grassland farming, said Dr L. Corkill, in his presidential address to the conference.

The Association had taken an active part in new developments responsible for these increases by fostering discussion between scientists, extension workers, farmers, and others interested in agriculture.

The use of certified seeds of pasture plants, for instance, was now general practice, and the pedigree of pasture plants was considered as important as that of the animals themselves, but this state of affairs had not arisen overnight.

High-producing Species Improved

After reviewing the history and development of pasture plant improvement in New Zealand, Dr Corkill said that there were now in commerce pedigree strains of some eight grasses and clovers.

"All of these are species suited to fairly high soil fertility conditions", he said. "They were the first chosen for improvement by breeding because it was considered that pasture production could most readily be increased by the use of potentially high-producing species, at the same time improving the habitat to the point where the improved strains could develop their potentiality for high production.

Changing Habitat Sound Approach

"To change the habitat to suit high-producing plants is in general a sounder approach toward increasing pasture production than to use plants suited to a low-producing habitat. That this approach has been sound is evident from the widespread use of high-producing species in areas where formerly only low-producing plants could survive.

"Excellent pastures are now being established in areas which a few years ago were considered the demesne of low-fertility pasture plants — the podzols of Northland, the pumice soils of the Central Plateau, and the foothills of Canterbury.

"The habitat has been changed by the application of improved fertiliser treatments, cultivation practices, and pasture management techniques. What was second-class is now first-class country. This build-up of fertility is rapidly extending over large areas of our hill country with the use of the aeroplane as an agricultural implement. The aerial sowing of fertiliser and seed has resulted in pedigree white clover rapidly ousting the low-fertility demanding annual legumes where moisture is not a limiting factor. Hair-grass and browntop are giving way to ryegrass and cocksfoot where topdressing and oversowing from the air are combined with chemical spraying to destroy the existing low-producing grasses.

"The day is coming", said Dr Corkill, "when the creation of vigorous pastures of high-producing pasture plants will not be limited by topography."

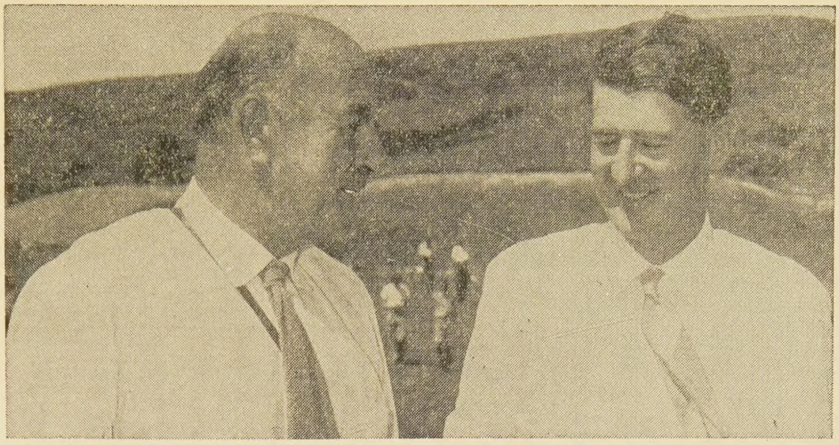
More Plant Improvement Possible

Much further progress would be made by plant breeding even in those species in which improvement had already been made, Dr Corkill forecast. The ryegrasses, cocksfoot, timothy, white clover, red clover, *Lotus*, and lucerne should still have priority in the breeding programme, but the wide variability in subterranean clover might profitably be exploited, and the possibilities within the genus *Festuca* (fescue) and *Festuca-Lolium* (fescue-ryegrass) hybrids should not be neglected.

Hybridisation between species to obtain combinations of desirable characters had been a rewarding method of plant improvement. Short-rotation ryegrass was obtained in this way and a strain produced by crossing short-rotation and perennial ryegrass appeared to be a promising addition to the ryegrass family.

A number of lines of approach to plant improvement had not yet been fully exploited and a comprehensive search in plant material from many sources was certain to reveal valuable genes that could be incorporated into bred strains.

"Up to the present most of the effort in plant breeding has been applied in improving quantity of production", said Dr Corkill. "In the future, greater emphasis will be placed on quality. But success will not attend the efforts of the plant breeder alone. It will need the combined resources of the biochemist, the soil chemist, the physiologist, and the nutritionist as well. Pasture quality is not only a factor of the plant but also of its environment."



Mr H. Woodyear-Smith (left), who received the Grassland Association's annual award, and Mr J. C. Percival (right), Ruakura Animal Research Station, who was in charge of field operations for the collection and testing of toxic grass during which the fungus causing facial eczema was recently discovered.

Association's Award for Betterment of Grasslands

The Association's award of a parchment citation and £50 in cash in recognition of outstanding contributions to the betterment of grasslands was made during the conference to Mr H. Woodyear-Smith, of Auckland.

As an officer of the Department of Agriculture and later as technical fields adviser to the Challenge Phosphate Company, Mr Woodyear-Smith had spent over 30 years promoting the betterment of grasslands in New Zealand, said the Association's president, Dr L. Corkill, in making the presentation. Very few agricultural officers in New Zealand had such a wide knowledge of grassland practices and as an able adviser, lecturer, and debater he had given practically a lifetime to promotion of improvement of the country's agriculture.

Mr Woodyear-Smith came to New Zealand from England in the early 1920s and after several years with the Department of Agriculture as an economist, instructor, and seed certification officer he joined the Challenge Phosphate Company. He is a foundation member of the Grassland Association and a member of many kindred agricultural organisations.

Future Research

Success in overcoming present marketing difficulties would depend on the degree to which we could lower costs of production by increasing the efficiency of grassland farming.

Research which led to the widespread adoption of phosphatic topdressing and the use of a pinch of cobalt or molybdenum on certain soils had had an immense effect on primary production, but there was still a lot to be done.

Supply of the most widely used fertiliser in New Zealand, phosphate, was not inexhaustible. Much that was applied to the soil was rapidly rendered unavailable to plant growth. Research that would result in greater efficiency of phosphate utilisation would certainly pay good dividends.

Soil : Plant : Animal Complex

That pasture was far from being the ideal diet for stock under certain conditions was evident in the paradox of stock starving when knee-deep in pasture, in cases of hogget ill-thrift, white muscle disease, and infertility. These troubles frequently occurred on vigorously growing, high-producing pastures. In the relationships between soil, plant, and animal there was still an immense field for exploration.

"Given adequate soil fertility, high-producing plants, and good-quality stock, it still remains to make the most of all these by adopting sound methods of pasture utilisation", said Dr Corkill. "Our fund of information on the principles which govern the maximum growth of plants within the constantly changeable community of pasture plants is rapidly building up. Research that results in better utilisation of pasture growth would immediately beneficially affect the efficiency of production of animal products from grasslands."

Foodstuffs from Crops

There was no reason why New Zealand could not grow foodstuffs from crops as efficiently as she did from pastures. Indeed, high yields of food would naturally follow the combination of crop and pasture where the pasture acted as a fertility builder for the crop.

"In years to come, as our population and the world population increase, I think there is no doubt that in New Zealand . . . the more easily cultivated land will be used to a greater extent for the production of food crops and the animal industry based on grassland will be concentrated mainly on the land of more difficult topography not suited to cultivation. In a minor way this trend is evident now; the Poverty Bay flats and the Heretaunga Plains are rapidly being converted from fat lamb pastures to vegetable gardens for the production of quick-frozen and canned foods.

"In New Zealand there are large acreages of easily cultivated land suitable for cropping which at present could be used for alternate crop and pasture production without greatly reducing the quantity of animal products. This year the acreage in wheat has doubled in comparison with that grown last year, but the estimated yield of 6 million bushels still amounts to only about 45 per cent of the country's requirements. There is no reason why we could not be self-sufficient in wheat; yields are high, averaging 45 bushels per acre; the farm machinery is available, and wheat can be grown satisfactorily in association with grassland farming.

"There will be a gradual and increasing trend toward diversification of our agriculture", said Dr Corkill, "with greater emphasis than heretofore on the production of food crops. In the meantime, a more efficient pastoral industry will assist directly in increasing our national income from animal products and better pastures will lay the foundation for better crops."

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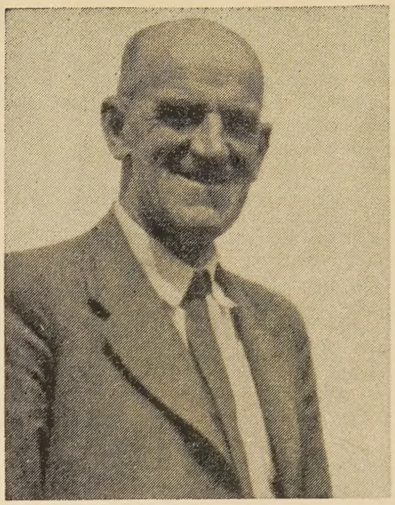
Future Conferences: Officers

Gisborne was selected by the Association's annual meeting as the venue for the next conference in 1959 and Invercargill was recommended for consideration of the incoming executive as the venue for the 1960 conference.

After considerable discussion of a report of unsuccessful negotiations between the Association's executive and that of the Society of Animal Production to try to arrange the holding of combined conferences, the incoming executive was recommended to try to arrange a combined meeting of the two organisations in 1959.

Officers of the Association were elected as follows: President, Mr C. E. Iversen; immediate past president, Dr L. Corkill; vice-president, Dr P. D. Sears; Mr G. S. Robinson; Mr I. L. Elliott; secretary, Mrs H. Foster.



Mr C. E. Iversen, Canterbury Agricultural College, Lincoln, elected president of the Grassland Association.

Book Review

"Farm Forestry"

"FARM FORESTRY", a quarterly publication first issued in November, signifies an important advance in the movement to engender greater interest among farmers in the planting of trees for timber, shelter, beautification, and soil and water conservation. It is to be the official organ of the 16 Farm Forestry Associations now established in major farming districts in New Zealand.

Statements in the first issue by the Ministers of Forests and Agriculture, the president of the combined associations, and the Director of Forestry emphasise the wisdom of an organised and well informed approach to the conservation of timber resources and the economic advantages, to individual farmers and the nation, of integration with practical farm management of a long-term policy of tree planting.

Papers from the second farm forestry conference at Palmerston North in 1958 are reprinted in this first issue and the programme for the 1959 conference in Taranaki is outlined.

The Forest Service and the Department of Agriculture have encouraged and supported the activities of farm forestry associations and this publishing venture by the combined associations could do much to spread the knowledge of species and habitat and cultural requirements that is so essential to efficient and economic farm forestry practice.

The annual subscription is 10s. (post free) and the publishers are Editorial Services Ltd., C.P.O. Box 2721, Wellington.

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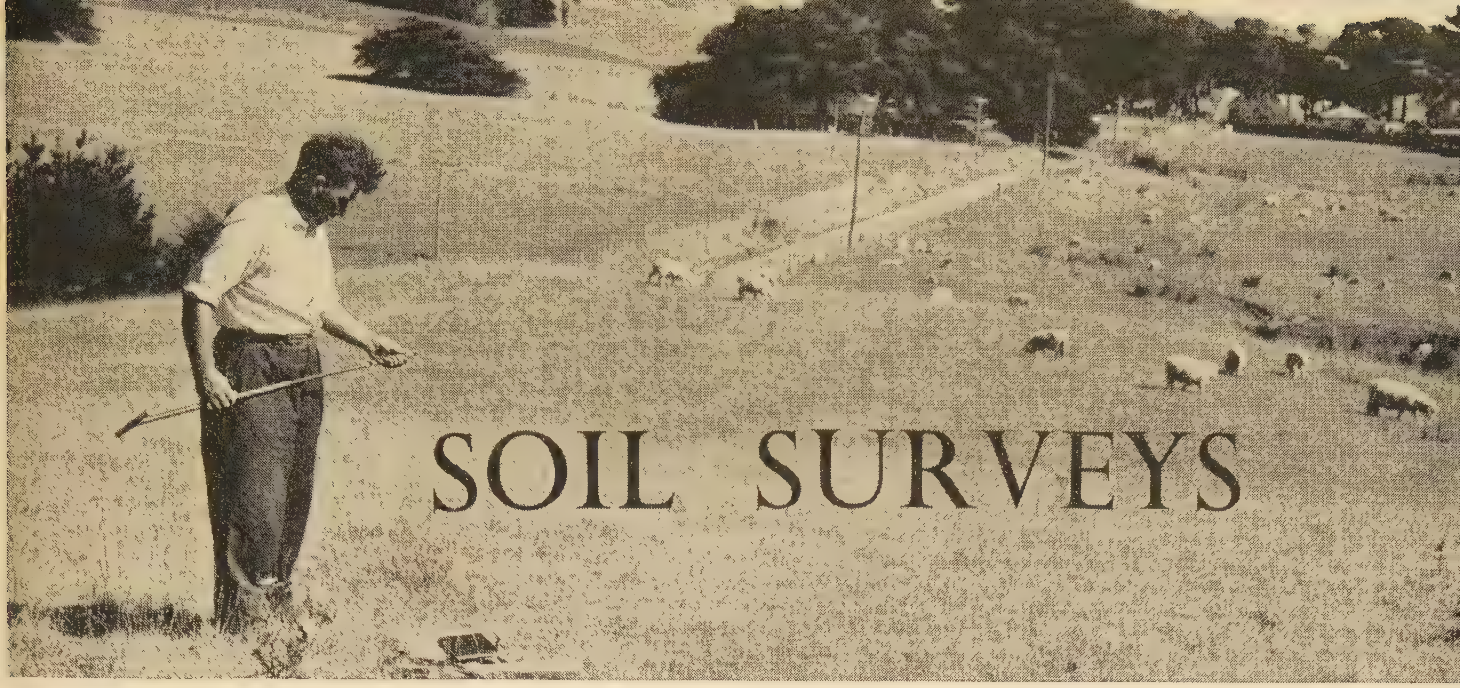


SOIL SURVEYS

By H. S. GIBBS,

Soil Bureau, Department of Scientific and Industrial Research, Wellington

BLACK river silt, brown volcanic loam, and blue papa clay are but a few of the names commonly given to soils in everyday conversation or in advertisements. With descriptions like these many a farm has been bought, many a fertiliser ordered, and, unfortunately, many a farmer disappointed when his soils have not lived up to their name. In many cases the name is true but is inadequate because it is derived from one or two superficial details. To get the proper name, one that will stand for all the properties of a soil, is work for a soil survey. This is a special study of soils to find out their various properties, where they differ, and what influence they are likely to have on plant growth.

IN New Zealand soil surveys are made by field staff of the Soil Bureau, Department of Scientific and Industrial Research. In the past they have also been made by staff of the Department of Agriculture and of Cawthron Institute. All surveys begin with a close examination of soil from top to bottom. The top is the litter of plant remains and animal droppings on the surface; the bottom is usually 24 to 36 in. underneath and the whole section is called the soil profile (see the illustrations on page 13).

Turning over the ground with a spade or plough merely reveals the upper part of a soil and neglects the middle and lower parts, which can be just as important to plant growth. For example, in parts of the Bay of Plenty district a black silty soil occurs both on the surface of highly productive farms and on land that is almost worthless without constant manuring. However, if profiles of the two areas are compared, the productive one shows a very gradual change in colour and in density downward, whereas the other shows a distinct change in these two properties about 7 in. below the surface.

Such differences as colour, texture, compaction, or stoniness below apparently similar topsoils give clues as to why one field can be used successfully for many purposes whereas under similar management another field gives low production from pasture, crop, or orchard. Therefore, a farmer should not judge a soil from the appearance of its surface any more than he would a farm animal from a view of the top of its head.

The inference that soils and animals are comparable is not as fanciful as it might seem. The mineral grains in a soil form a similar framework for activities as the skeleton in an animal. The clay particles serve as tendons to bind the farmework together and as meat to hold nutrients until required. Solutions circulate through soils carrying substances from one part to another like a bloodstream. Both soils and animals contain bacteria and other organisms to digest materials and convert them into compounds that can be taken into circulation again. During the development of both soils and animals, oxygen is absorbed and carbon dioxide given off. Animals grow upward whereas soils grow downward.

This comparison illustrates how soil differs from inert deposits like coal or limestone. Soil is a renewable substance formed by the continual action of air, water, plant roots, and microbes on mineral and vegetable materials. As both the activities and the materials vary from place to place, soils develop differences that depend not only on what materials the soils are formed from, but where they are, how long they have been there, and what has occurred in that time. These are facts that cannot be determined wholly by a chemical analysis or an inspection of a geological or botanical map. Each of these methods supplies useful information, but cannot take the place of a field examination.

The first stage of a survey is to find out where soil properties change by digging or boring a series of holes with a spade or auger. When differences of colour, of depth, of texture (grain size), of structure (size and shape of the lumps), or of stickiness of any part of the soil profile are found, the sites are marked on a map. Sites of these changes are joined up to enclose areas of essentially the same kind of soil. This unit of mapping is called a soil type and is the accepted basis for comparing areas of soils.

Soil types do not take into account the differences produced by ploughing, topdressing, or past or present crops. If they did, a soil map would consist of a series of small squares and rectangles enclosed by paddock fencelines and become only a record of land use. Effects of farming are noted but not mapped because they are temporary features and not basic information. If required for very detailed comparisons,

SOIL SURVEYS . . .

the effects may be superimposed on a soil map. Changes such as large-scale removal or dumping of soil are mapped. Thus the soil map of Waipa County shows the areas where Maoris had made soils for kumaras by spreading a thick layer of gravelly sand over the surface.

During a soil survey samples from each soil type are collected for chemical, physical, and biological analyses. These analyses find out the acidity, the content of any element, the pore space, the kind of clay, the bacterial counts, and numerous other properties of the samples. They improve field descriptions by adding details of invisible properties and by giving more accuracy to some of the observations. Some of the analyses may also be used to estimate fertiliser requirements, but for this purpose they must take into account the moisture, temperature, and biological conditions of the soil, which are properties obtained through a soil survey. The direct application of soil analyses to farming is rather like prescribing pills for a patient complaining of lack of energy without knowing his age, history, or occupation.

After the field work and analyses are done the scientist in charge of the survey sorts out all the information, prepares and checks the explanations of differing properties, and writes a full description for each soil type shown on the soil map. This description is not just a list of observations, but includes predictions of the requirements of each soil for particular uses.

The soil map and report are then published, usually in the form of a bulletin or short paper in an agricultural journal. A list of published soil surveys is given in the panel on this page. The bulletins of district and detailed surveys are usually written in collaboration with members of the Department of Agriculture so that the technical work of the soil surveys is blended with farming practices and experience in the district. In this way interpretations and recommendations are "brought to earth" and the bulletin includes all available knowledge on the soils and their present uses.

USES OF SOIL SURVEYS

The principal advantages of soil surveys to the farmer are as follows:

1. To make a map showing the locations and areas of each kind of soil.

From the soil map a farmer may see that his land comprises two, three, or more soil types and where each is to be found. Each soil type comprises soils that are similar in description, formed under similar conditions, and occupy an area of land. These rules ensure that soil types are units of practical value to a farmer. Observed or reported differences in farming are not sufficient to establish a soil type unless supported by a natural difference of texture, colour, or compaction of part of the soil or of composition of the rock materials from which the soil is formed. Thus the type of soil is generally not altered by farming and it is the widely accepted unit for comparing soils for farming purposes.

For reference soil types are given names. The first part is a locality name such as Taita or Timaru taken from a place where the particular soil is common. The second part is the texture of the topsoil. Thus a name like Taita silt loam does not mean either that Taita is the only locality where this soil type is found or that the soil is a silt loam in texture from top to bottom. Once the name is properly established it serves as a convenient short description for all the properties and is preferable to the "black river silt" or "yellow clay" style of name.

Examples of soil maps may be seen in the published bulletins of the Soil Bureau and in "The New Zealand Journal of Agriculture". A sample map is shown on page 11. Where the published scales are too large to show the pattern in detail, only the principal soils can be shown. However, a farmer who discovers soil differences during fencing, ploughing, or stumping his land can use the descriptions to identify the soils, locate the boundaries, and perhaps build up his own soil map.

2. To give a full description of soils.

After a thorough examination a soil survey gives a list of details of both upper and lower parts of the soil. For example, one of the "brown volcanic clays" of the Waikato district would be described as consisting of 6 in. of brown friable clay loam with a fine crumb structure, overlying 24 in. of yellowish brown firm clay with a coarse nutty structure and grading downward into andesitic volcanic ash. Details of invisible properties such as the acidity and content of nitrogen, phosphate, potash, and lime of the untopdressed soil are added to show the conditions in different parts of the soil.

An outline of how the soil was formed and what is now happening is indicated in the section on classification. Thus a farmer gets a clear picture from which he can understand his soil. Though he rarely would want all these details at the same time, they are catalogued for reference when he wants to know whether his soil is a silt loam with naturally good structure, slow drainage, compact subsoil, slight acidity, or high nitrogen; whether it has a short history and the low lime is due to the original rock materials, or it has a long history and the low lime is due to severe leaching of

LIST OF PUBLISHED SOIL SURVEYS

District Surveys
(Scale 1 or 2 miles to 1 in.)

- Kaitaia district
- Whangarei County*
- North Auckland*
- Great Barrier Island
- Matakaoa County
- Mid Hawke's Bay
- Wairarapa Plains*
- Manawatu sand country
- Eastern hills, Waimea County†
- Wairau Plains
- Westport district
- Kowai County*
- Duvauchelle Bay
- Downs and plains of Canterbury and North Otago*
- Ashburton County
- Levels Plain
- Green Is.-Kaitangata district
- Balclutha district
- Tapanui district
- Gore district
- Upper Shotover catchment
- South-western Southland

Reconnaissance Surveys
(Scale 4-8 miles to 1 in.)

- North Island
- South Island*
- High country, South Island
- Westland
- South-west Fiordland
- Marlborough
- Moutere Hills†

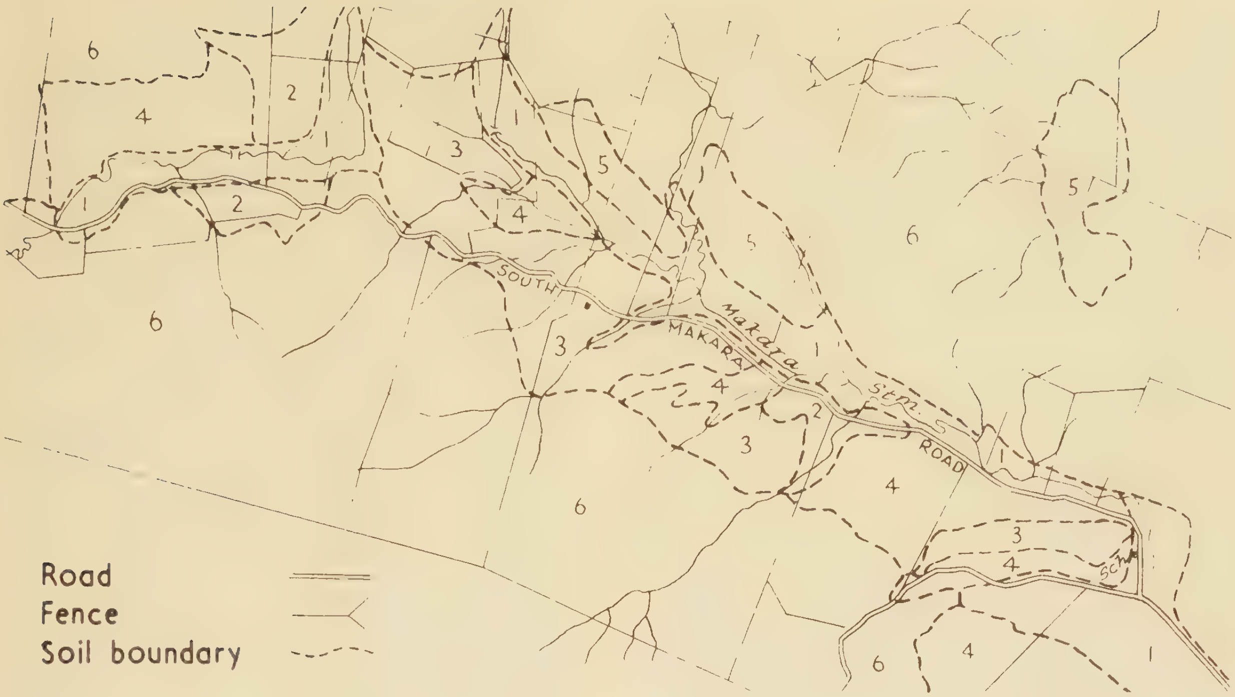
Detail Surveys
(Scale 20-40 chains to 1 in.)

- Kerikeri district
- Part Waipa County
- Kaingaroa-Galatea district*
- Gisborne Plains*
- Heretaunga Plains
- Greytown Plain*
- Te Wera State Forest
- Oroua Downs district
- Ellesmere County*
- Geraldine County
- Lower Clutha Plains
- Maniototo Plains*
- Alexandra district*

* Report in preparation, soil maps available for perusal at the nearest district office of the Soil Bureau, or Soil Bureau, Wellington.

† Soil survey by Cawthron Institute.

MAP SHOWING AREAS OF EACH KIND OF SOIL



Soil map of part of Makara district. 1—Waiwhetu silt loam. 2—Heretaunga mottled silt loam. 3—Judgeford silt loam. 4—Judgeford hill soils. 5—Korokoro hill soils. 6—Makara steep-land soils.

soluble substances. These are a few examples of the increased information that a farmer gets from the detailed description of his soil and which enables him to use and treat his soil more efficiently.

The soil map and description also allow him to plan the use of his soils to best advantage. Thus, if a farm has only a small area of soil good for growing crops, the homestead or cowshed should not be built in the middle of this area if it can be avoided.

3. To show where the experiences of farming may be used.

When a farmer finds that a particular crop or treatment is successful he may locate areas on which to apply this experience from a soil map. This map identifies the soil type concerned and the other areas of this soil then show him where similar results may be expected. If areas occur on his farm, he can arrange work without the uncertainty of a soil difference; if not, the farmer gains information that is very useful in either comparing or buying land. The association of farming experience with soil type is a sound means of building up knowledge of a district and is a reliable guide to methods suitable for different parts of a farm.

Soil surveys are the means of spreading the information gained from the experimental plots of the Extension Division of the Department of Agriculture. In these plots are tested the performance of various plants, practices, and fertilisers on different types of soils and the results are compared over a number of seasons. For example, pasture trials on three widespread soil types in the Waikato district showed:

(a) Horotiu sandy loam responds well to phosphate, slightly to lime, and develops a potash deficiency fairly rapidly under pastoral farming. There is no evidence of trace element deficiencies.

(b) On Hamilton clay loam there is a good response to both phosphate and lime, but this soil type is much slower in developing potash deficiency than Horotiu sandy loam. There are also no trace element deficiencies.

(c) On Marua clay loam the response to phosphate is only fair, unless lime has also been applied. There is evidence of molybdenum deficiency but none of potash.

Similar experiences are found in other districts and results of various fertiliser trials or pasture mixtures or methods of cultivation on different soil types are reported in "The Journal of Agriculture". Local results can always be obtained from the Instructor in Agriculture for the district. To the soil type information he can add such varying factors as the price of wool and fertilisers, distance from markets, availability of machinery and labour, and so give practical recommendations for individual farms.

Soil types do not differ from each other in every detail and many soil types may have the same requirement for phosphate, lime, or drainage. However, the combination of soil types for each requirement is not the same, and the phosphate map, lime map, and drainage map for an area will each show a different pattern. The pattern will also change with the kind of crop—lucerne or lettuce—but in all cases the soil map provides the background for transferring results from one area to another. The pastoral use map of Matakaoa County published with the soil survey of that district is an example of the kind of map that can be prepared from a soil map. It shows up the soil limitations on pastoral use and the distribution of problem areas.

A soil map of coastal hill country south of Dunedin was used to indicate areas suitable for permanent agricultural production and the areas more suitable for afforestation. The division between soils for agriculture and for forestry is rarely clear cut and there is usually a zone where the pattern of the soils becomes more important than the favourable properties of an individual soil. Thus where the pattern of soil types shows that the areas suited to agriculture are small and scattered, forestry is probably the better use for the whole area. If soil maps had been available in the early days of settlement, they would have saved farmers of some districts a lot of effort, time, and materials.

4. To investigate farming problems.

When stock do not gain weight, plant growth is unexpectedly poor, bare ground is appearing in previously dense pasture, or methods of drainage or of irrigation are being considered, the soil is one of the main factors in deciding what ought to be done. The advantages of soil surveys in such problems are illustrated in the following examples.

Advantages of Soil Surveys

Until 1936 bush sickness was a widespread stock ailment in New Zealand. Soil surveys demonstrated that it was very common on soils derived from two showers of volcanic ash (called Taupo pumice and Kaharoa ash) and this occurrence indicated some characteristic inherited from the erupted material. When animal experiments proved this ailment to be due to a deficiency of cobalt, the soil maps demonstrated where the element was needed and that about 4,000,000 acres of pumice lands in the central parts of the North Island would benefit from the discovery. Experiments by Cawthron Institute in Southland and Nelson and by the Department of Agriculture in the Wairarapa district have found cobalt deficiencies on the soils derived from particular materials, and soil maps have shown farmers and farm advisers where cobalt should be supplied to grazing animals.

Symptoms similar to bush sickness were also found in the stock of certain farms in the Te Kuiti district where the soils were derived from an ash shower called Mairoa ash. Yet on many farms where the soils were derived from the same material stock were quite healthy and only when the various soils derived from Mairoa ash were placed in order of increased leaching was it clear that the deficient soils were all strongly leached. In these soils the cobalt deficiency was acquired through leaching and could be expected on farms comprising other soil types at the lower end of the list.

The arrangement of soils according to the extent of leaching can be made after a soil survey and is proving a very useful means of investigating deficiencies of trace elements in a large number of soils. Thus, when a pasture or crop is found to respond to a new treatment such as the recent discoveries of molybdenum or copper the chemist no longer has to analyse every type of soil to find out the range in amount of the element and the probable level of the deficiency. He can reach this conclusion by examining members from the upper, middle, and lower parts of a sequence of soils and narrow down further laboratory and field work to a particular bracket of soils. This not only saves much costly work on unnecessary analyses and field experiments, but gives many farmers reliable results years sooner than they would otherwise have had them.

In parts of Westland the development of land for pastoral use met with little success and reasons for many of the failures were never clear. The soil survey found that the major problems were slow drainage and low fertility and that these occurred either separately or together. During the survey areas requiring drainage only were separated from those requiring fertiliser only, and each of these from areas requiring both treatments or neither.

Most of the failures occurred on the group of soils requiring both drainage and fertiliser and which occupied 300,000 acres of undulating land between Westport and Ross. A common feature of the soils on this land was a very silty structureless subsoil through which the passage of water was extremely slow. Improvement of the permeability of the subsoil was the first requirement for pastoral farming and until this was achieved the soils were better adapted to trees suited to swampy sites. Without adequate drainage, fertiliser treatments for pastoral purposes had little value, but for forestry purposes would probably increase timber production.

Though drainage is the general remedy for excessive moisture, there are occasions when it may not be advisable. For example, a soil survey of the Foxton district by J. D. Cowie mapped areas of peaty soils in small swamps among large areas of sandy soils. If the peaty swamps were drained to develop these areas for grazing, the lowering of the level of ground water in the surrounding sandy soils would lessen their moisture content and their production so much that the drainage would probably cause an overall loss from the farm. In this case the best solution to the drainage problem would be to spread sand over the peaty soils and mix the two materials together.

In dry regions like Central Otago lack of moisture is one of the principal limitations to plant growth and may be provided by irrigation. Yet in some localities irrigation has produced serious problems of waterlogging and salinity. Soil surveys in the Alexandra, Ida Valley, and Maniototo districts have shown that most of these problems are related to factors such as lack of porosity in a part of the soil or to soluble salts in the parent materials. The surveys show the areas of soils having dangerous properties and where problems may arise unless methods of irrigation are altered to avoid the effects of these soil properties. At the same time the maps show the types of soils that most need water and would derive the greatest benefit from irrigation.

A soil survey of the "high country" of the South Island mapped out the pattern of the soils and the amount of soil erosion that had taken place over 10,000,000 acres. Among other details it demonstrated the very serious extent of the erosion on Kaikoura soils and the need for changes in farming practices if these soils were to continue as grazing lands and the supply of debris to the river beds was to be controlled.

Since 1945 molybdenum as a supplementary fertiliser has achieved wide prominence through the marked plant responses obtained by applications at only 1 or 2 oz. per acre. The discovery explained many of the problems of better responses of pasture to basic slag than to superphosphate, but the very smallness of the applications has made it important to have proper soil information. Here soil surveys have given a twofold benefit.

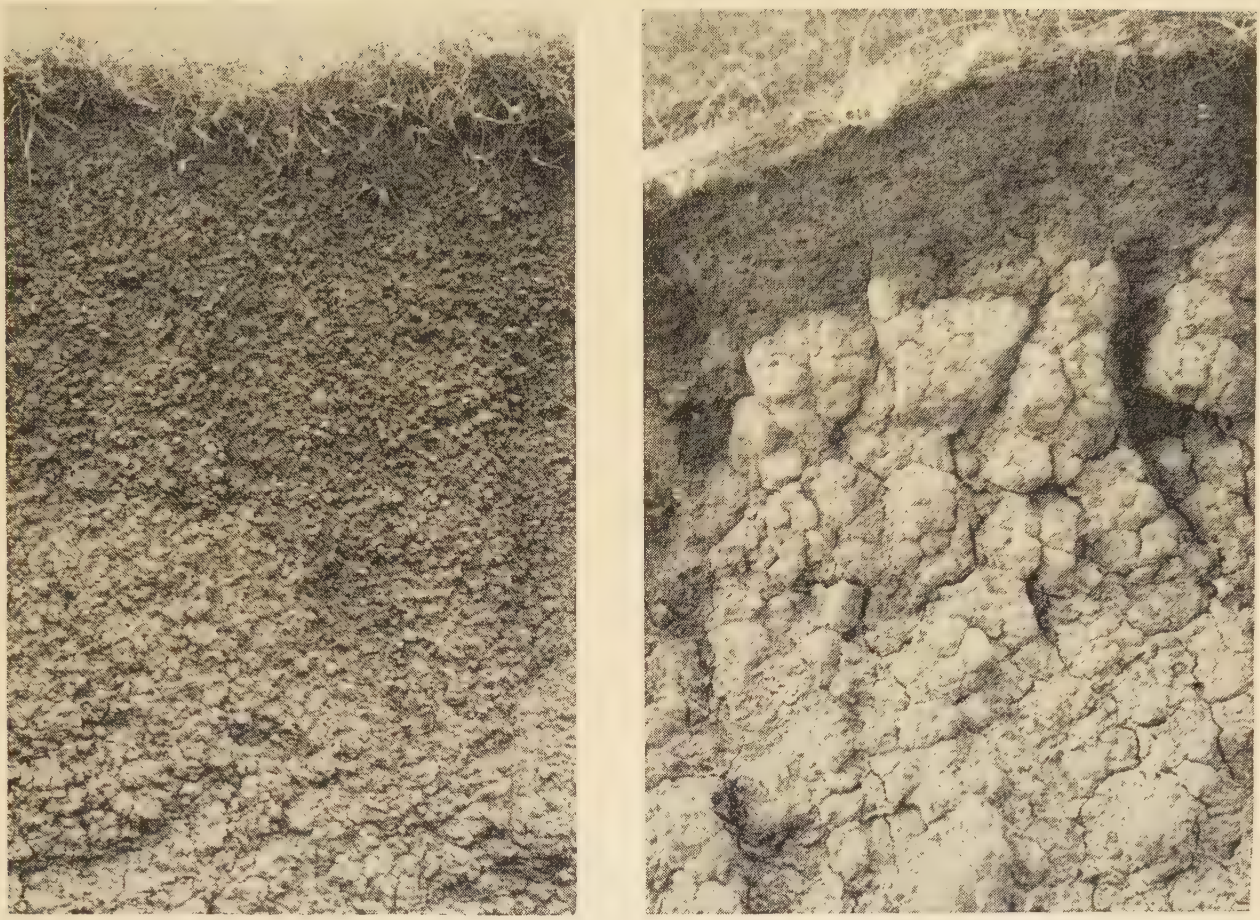
Firstly, they have shown that many areas of Otago, Canterbury, Nelson, Wellington, and Northland have soils similar to the trial plots where a deficiency of molybdenum has been demonstrated (for examples, see "The Journal of Agriculture" for April, July, and August 1957 and May and June 1958).

Secondly, they show where it is unnecessary and possibly dangerous to stock health to apply molybdenum (see "The Journal of Agriculture", September 1957).

Thus when in analyses at the Department of Agriculture's Wallaceville Animal Research Station it was found that some pastures from the Wairoa district were unusually high in molybdenum a soil survey showed that these pastures were all grown on soils derived from a particular deposit of volcanic ash. The soil map showed where these soils occurred and where copperised superphosphate should be used to offset the effects of high molybdenum in the soils.

During the last few years reports of pasture and animal problems have been increasing and this trend has led some writers to blame present-day farming with fertilisers. However, most of the problems are a natural consequence of the uneven distribution of elements in many soils and the increase in the intensity of farming. Soils can (and must) produce more food, but some cannot provide the elements in the right proportions for high production. Correcting these proportions with fertilisers is just one of the modern methods toward increasing the food supply.

Soil surveys can make the methods more efficient by reducing the waste in material and time in finding the



An example of the difference in physical properties between two subsoils in the Wairarapa. Both soils have a greyish-brown silt loam at the surface and are derived from the same geological material.

best treatment. New chemicals, new machines, and improved plants are being developed all the time. The particular benefits they can supply and problems they are likely to create can often be more readily seen by an examination of soil types.

Coverage of Soil Surveys

All of New Zealand has now been covered by soil surveys on a scale of 4 miles to 1 in. Surveys on this scale do not map areas of less than 500 acres, which means grouping smaller areas of soil types into broad units called sets. These surveys indicate the pattern of the main soil types on large farms and provide the framework for more detailed surveys. Reconnaissance survey maps covering all the North Island have been published and brief descriptions of each of the 650 units mapped are printed in Soil Bureau Bulletin 5. In the South Island similar maps and descriptions for Westland (Soil Bureau Bulletin 2), South-west Fiordland (Soil Bureau Bulletin 7), Marlborough (Soil Bureau Bulletin 9), and Moutere Hills (Bulletin of Nelson Catchment Board) have been published, and the survey of the whole South Island is being prepared for printing at present.

District surveys on a scale of 1 or 2 miles to 1 in. have mapped 11,500 square miles of the North Island and 8,500 square miles of the South Island. These surveys map areas of soil types greater than 50 acres and are well suited to showing the distribution of soil types on rolling, hilly, and steep lands.

Detailed surveys on a scale of 20 to 40 chains to 1 in. have mapped 5,000 square miles of the North Island and 1,500 square miles in the South Island. They show soil types in areas as small as 5 acres and are particularly suited to flat land which is, or is expected to be, used for intensive farming.

Most of the bulletins are issued at a price to cover costs of printing, but if farmers do not wish to buy them, they may see them at district offices of the Soil Bureau or of the Extension Division, Department of Agriculture. Detailed inquiries on the requirements of soil should first be made to the local Instructor in Agriculture who has copies of the soil maps of his district and on request will relate soil to other farming information for particular cases. If the identity of a soil is not known, he will find it out; if the effects of previous farming are required, he may collect samples for soil tests at the Department of Agriculture's Rukuhia Soil Research Station. Once the type of soil is known the detailed descriptions and explanations of the soil survey report give a wide and reliable basis for practical conclusions.

With populations increasing everywhere there will be a continual demand for more food. For this reason, as well as for economic considerations, New Zealand soils will be expected to grow more grass and more crops. This can be done more easily and more efficiently if farmers know where and why their soils differ from place to place. Knowing such details farmers can be more certain that they are working with their soils and not against them and therefore are more likely to get the maximum benefit from the work they put into their land.

Code for Dairy Farmers with Approved Standard Technique for Cleaning Plant and Equipment

By the DAIRY DIVISION,
Department of Agriculture

A SUMMARISED code of standard requirements in milking sheds has been prepared by the Dairy Division at the request of and after negotiations with the Dominion Dairy Produce Section of Federated Farmers and will be available soon to all dairy farmers. The information is on a single sheet of durable paper which should be tacked up in a suitable place in the milk room where it will not get splashed by milk or water or damaged by other means.

THE code, which has been approved by the appropriate section of Federated Farmers, includes

(a) Definition of a "dairy" as prescribed in the Dairy Industry Act 1952;

(b) Specific requirements regarding the control of pigs, cows, fowls, etc., embodied in the Act; and

(c) Regulations under the Act which prescribe necessary standards in buildings and plant.

To assist farmers toward adopting precise technique in cleaning milking plant and equipment a list of instructions is included in the sheet.

The authority and duties of Farm Dairy Instructors are also briefly described.

Issuing of this guide does not indicate a change in policy in the administration of the instructional service. The idea of publishing a code of standards in milk production originated from the Dominion Dairy Council of Federated Farmers. The code should assist toward a better understanding of legal requirements and the adoption of better standards in and around the dairy premises. These will undoubtedly be reflected in the production of higher-quality goods, which should be the aim of all concerned.

Details in the code sheet follow:

1. A dairy includes the milking shed, releaser room or milk-collecting room, and the yards.

2. Surroundings of every dairy must be kept sanitary and the traffic of stock controlled.

3. No cesspool, sump, manure heap, calf house, or fowl house is permissible within 30 ft. of the dairy premises. Proper drainage is imperative.

4. Pigs must not be kept, housed, or allowed to come within 50 yds. of any dairy premises.

5. A petrol-driven engine or fuel-burning water heater must not be used in the releaser room or milk-collecting room of any dairy.

6. All walls surrounding the milking premises must be of concrete not less than 4 ft. high and plastered to a smooth surface for their full height.

7. There must be no openings other than those necessary for piping and transmission of power in the walls between the releaser room or milk-collecting room and any adjoining room.

8. The milking premises must be provided with adequate ventilation and with facilities to prevent entry of rodents and other animals to the milk room.

9. Concrete holding yards must be provided and kept clean.

10. All floors must have a smooth surface that can be readily cleaned.

11. Releaser rooms and milkstands must be lined and kept clean and tidy.

12. All woodwork and/or ironwork must be kept clean.

13. Equipment must be installed so that there is easy access for dismantling and cleaning.

14. Milking machines and metal equipment must be kept clean and properly tinned.

15. Milking machines and metal utensils must be thoroughly washed and cleaned after **every** milking.

16. Water-heating appliances must be of a capacity sufficient to supply water at or near boiling temperature. (Check with your Farm Dairy Instructor the heater size and element required.)

17. All milk or cream must be cooled to 65 degrees F. and must be adequately protected from the direct rays of the sun.

18. Udders and teats must be thoroughly washed and dried before teat cups are applied.

19. Suitable brushware and detergents must be provided for cleaning.

20. A milking shed must not be erected within 2 chains of a public road without the approval of the Director of the Dairy Division.

Cleaning Procedure at Every Milking

Before Milking

Flush the machine before milking with clean cold water drawn from a tap.

Immediately After Milking (Do Not Break the Vacuum)

1. Wash the outside of teat cups and claws.

2. Flush each set of cups with at least 1 gallon of cold or lukewarm water.

3. Draw 1 gallon of boiling water, with detergent added at recommended strength, through each set of teat cups.

4. Use the traveller brush to clean the main milk line and keep it from accumulating milkstone.

5. Draw at least 1 gallon of clean boiling water through each set of teat cups to flush out the detergent solution.

6. Treat the pulsator and vacuum systems in the same manner and give particular attention to the breather rubber.

7. Brush metal pipes regularly.

8. Remove teat cups and long milk rubbers from the machine and open taps to allow air to circulate and dry the machine.

9. Wash the outsides of rubbers with an alkaline solution; rinse them with hot clean water; then hang them in a clean dry place.

10. Hand scrub the releaser, vacuum tank, separator parts, vat, and utensils with an alkaline solution and rinse them with hot water direct from the heater.

11. Remove all plugs and leave all ports and the vacuum tank open.

12. Treat milk lift pumps in the same manner as a set of teat cups.

13. After flushing open up the machine to drain and dry.

Periodically

1. Examine all rubber to see that it is in good condition and disconnect pipe unions to ensure that they are clean.

2. Examine claw caps and down dropper taps for the same purpose.

General Powers and Duties of Farm Dairy Instructors

Farm Dairy Instructors are appointed inspectors under the Dairy Industry Act 1952, with authority to administer the Act where it applies to farm dairies. For refusal to comply with certain orders issued by the inspector a prosecution can be taken. If there is insanitation, an inspector may also forbid the removal of dairy produce until the defects are remedied to his satisfaction.

Dealing with Wax Cappings and Prevention of Robbing

By D. A. BRISCOE,
Apiary Instructor, Department of Agriculture, Tauranga

AFTER honey has been extracted from combs the disposal of the wax cappings is often a problem for the domestic beekeeper. Not only do these cappings contain a lot of honey, but they are valuable for their beeswax content. Quite often, not knowing what to do with them, the beekeeper throws them out or buries them in the garden. This article suggests ways in which the cappings can be dealt with and also discusses how robbing of hives can be prevented.

AFTER extracting has finished the cappings should be placed in a colander, large wire strainer, or some such appliance placed inside a larger container so that the honey will drain away from the cappings. This honey is perfectly good and may be added to that already extracted. The cappings should be allowed to drain for at least 24 hours and if the weather is cool or the pile of cappings is unduly deep, they should be agitated or turned over occasionally. Otherwise the cappings will pack down tight, trapping honey inside the mass rather than allowing it to drain away.

When the cappings are thoroughly drained and free of honey they are then ready for melting.

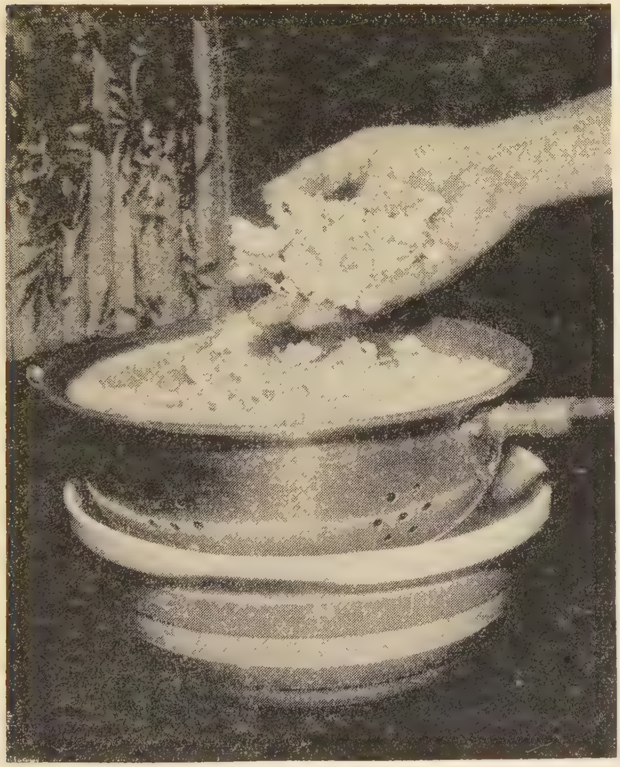
Domestic beekeepers who do not possess a solar wax extractor or other type of wax-rendering appliance can deal with the cappings in the following way:

Put a preserving pan on a stove with about 2 in. of hot water in it, and when the water is boiling, slowly add the wax cappings. Do not heap cappings in beyond the capacity of the pan and keep sufficient heat under the pan to ensure an even simmering. As beeswax boils over very readily, it should not be boiled too hard. An occasional stir may be necessary to ensure that all the cappings are thoroughly melted. If there appears to be an excess of foreign matter floating on the top of the wax, this may be skimmed off.

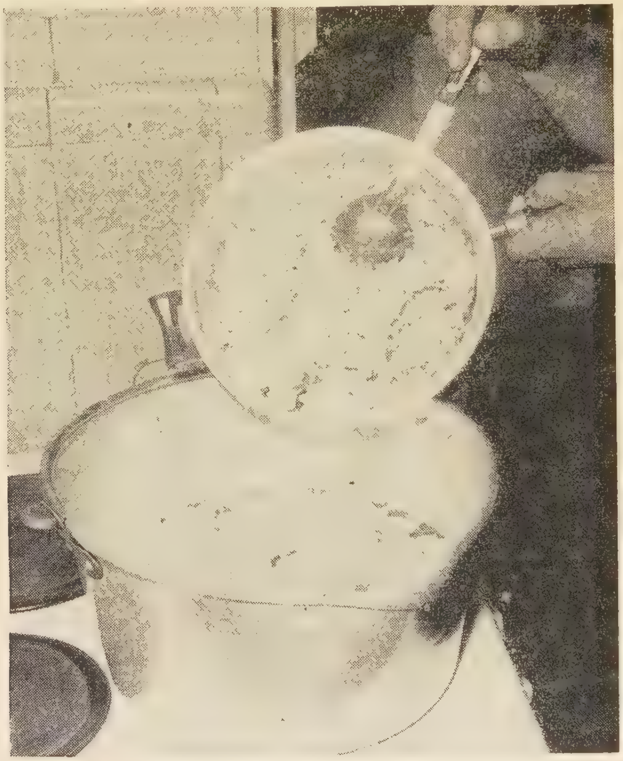
The melted wax and water can be poured from the pan into small moulds and allowed to harden. Until the wax hardens it floats on the water and if dirt is present, it will settle at the bottom during cooling and may be cut from the cake. Usually this will not be necessary, as cappings seldom contain slum gum.

Prevention of Robbing

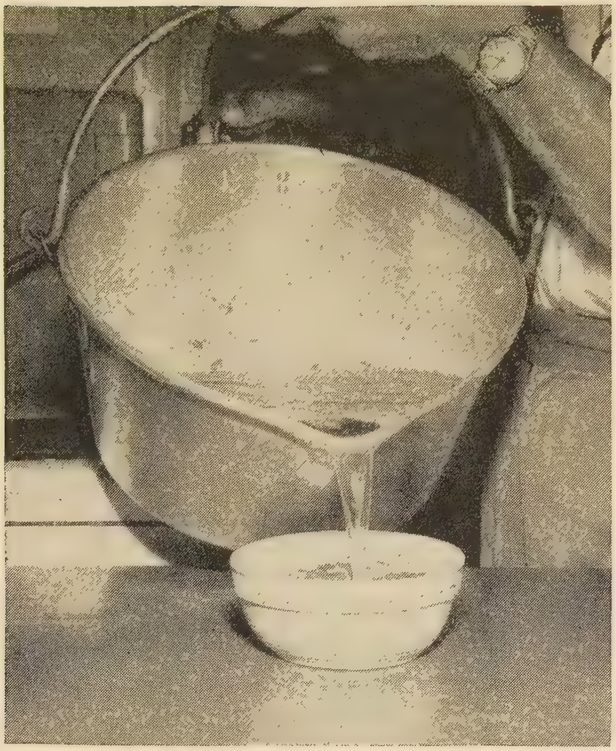
In districts where the honey flow is tapering off field bees are inclined to rob other colonies in the apiary. Every precaution should be taken to avoid this happening, as robbing once started is extremely difficult to control.

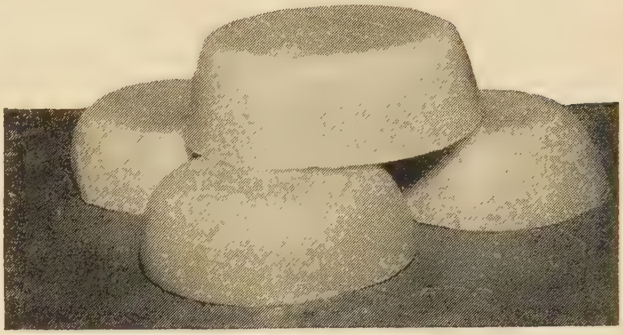


Wax cappings thoroughly drained of all honey.



The cappings being tipped into a pan with about 2 in. of hot water in it.





▲ The cakes of wax after being removed from the moulds.

← The completely melted wax being poured into moulds.

Care should be taken that combs of honey and pieces of burr comb containing honey are not left where they are accessible to foraging field bees. Supers containing wet combs should not be placed on hives during daytime, as the presence of wet combs excites the bees and causes widespread and violent robbing. Robbing from this cause can be avoided when supers of wet combs are returned to the hives in the evening.

When wax cappings are being dealt with at the end of the season the work should be done in a bee-tight building. The smell of heated wax has a strong attraction for searching bees.

Weak hives and especially nucleus colonies should be watched carefully for signs of robbing. Keen observation will soon enable the domestic beekeeper to distinguish robber bees, which fly nervously round hives searching for some unguarded entrance. Bees usually take flight direct from the alighting board, but if they are noticed crawling up the side and front of the super before launching into the air, it is a good indication that robbing is in progress. If a hive is being constantly attacked and robbed, the size of the hive entrance should be reduced. In some cases it is advisable to exchange robbed and robbing hives. This manoeuvre apparently demoralises the bees and the robbing usually ceases.

Photographs by Rendells.

Book Review

"Early Victorian New Zealand": John Miller

THE title of this book is slightly misleading, as it deals with the New Zealand Company's settlements around Cook Strait only and says nothing about Auckland or the southern settlements. But it does give a vivid picture of life of the small communities at Wellington and Nelson and we are fortunate that so many of the early arrivals kept diaries or wrote frequent letters. Many of these papers are preserved in the Alexander Turnbull Library. An optimistic thread runs through all of them, an optimism that was scarcely dimmed by the rawness of the landscape and the thought of heavy tasks that would face the newly arrived settler.

The Wakefield ideal was the creation of a compact agricultural community reproducing as far as was possible the social structure of rural England. Dr Miller emphasises how little this was in tune with the realities of the situation and he also points out that relatively few of the original settlers had much idea of practical farming. Yet their inexperience and lack of application were not the only cause of their difficulties. Around Wellington conflicts with the Maoris arising out of the offhand manner in which the Company's representative, Colonel William Wakefield, had gone through the motions of buying the land prevented many of the settlers from taking up their holdings for several years. Around Nelson the Company had enthusiastically sold a very large area, much of it to absentees, but much of it also on the Moutere gravels. The development of this land has been possible only in recent years, so the unfortunate settlers in the 1840s had little hope of doing much with it.

Dr Miller again draws attention to the significance of the first ventures at squatting in the Wairarapa. He points out that such men as Bidwell, Clifford, and Weld were not only beset by difficulties produced by inexperience, but they then possessed no valid title to the land and were technically committing a breach of the law. While the wealthier men were devoting their attention to sheep, many of the labourers brought out by the Company had established themselves on small holdings near the towns which at least gave them a degree of security. Describing the situation at Nelson Dr Miller remarks, "Not all these Nelson labourers raised themselves, but the fourth son of one of them was Ernest Rutherford".

Oxford University Press, 30s.

—P.R.S.

Organisation of Pollination Service for Farm Seed Industry

By T. PALMER-JONES,
Principal Scientific Officer, Department of Agriculture's Animal Research Station, Wallaceville

THE white clover seed industry of New Zealand depends almost entirely on honey bees for pollination. Though the seed-growing areas are well stocked with hives for honey production, their numbers appear inadequate for intensive seed production. The organisation of a pollination service by beekeepers and projected research into white clover pollination are discussed in this article. The pollination of mixed clovers recently sown for the first time in the Mackenzie Country is examined and the role played by bumble bees as pollinators there and in other hill country areas assessed.

WHITE clover is unquestionably one of the most valuable pasture plants in New Zealand. It may be used for grazing or for hay and silage; its nitrogen-fixing ability makes it an important component of mixed swards; it is a remunerative seed crop; and with suitable treatment it will flourish on a wide variety of soils. White clover is almost entirely dependent on honey bees for pollination. Seed must be set not only to help in its natural regeneration in some localities, but to provide the large quantity required for resowing. White clover seed is a valuable export, an average of over £500,000 worth having been exported annually in recent years.

Lucerne and red clover flowers do not always yield nectar readily to honey bees, which are prone to leave them for more attractive plants. Consequently skill in apiary management is necessary to obtain effective pollination of these crops with honey bees. Commercial beekeepers do not regard lucerne and red clover with favour and will not usually place hives in their vicinity. By contrast both the nectar and pollen of white clover are attractive to honey bees, which have no difficulty in collecting them because the floral structure is favourable. Flowering white clover provides the bulk of the honey produced by our commercial beekeepers and rarely are areas not fully stocked with hives for honey production.

Pollination Requirements

No experimental work has been undertaken in New Zealand with the aim of finding the number of hives per acre which should be used in white clover seed production. The main reason for this is that white clover in pasture yields large quantities of high-grade honey and so has attracted commercial beekeepers, who have put down hives in numbers thought by most seed growers and farmers to be sufficient to provide effective pollination. Occasionally a farmer may hire bees for pollination, but the practice is uncommon.

The low concentration of hives in seed-growing areas is illustrated by the case of South Canterbury, which is one of the main centres of the white clover seed industry. The downlands to the south and west of Timaru, between the Pareora and Otaio Rivers, are typical of the district. Department of Agriculture records show that the downlands, an area of about 36 square miles, contains some 470 hives disposed in 30 apiaries. The downlands includes land taken up by rivers, roads, buildings, etc., and so not available to bees. In addition, during the flowering period of white clover some would be taken up by wheat or fallow and some by brassicas which would be no longer attractive to bees.

Bees would, therefore, be forced to concentrate to some extent on white clover during its flowering period. But even if we assume that half the downlands is not visited by honey bees, only about 1 hive per 25 acres is available for white clover pollination. This concentration of hives is typical of the area between the Pareora River and Oamaru, but north of the Pareora River the hive density is about 65 per cent more.

Examining hives in a pollination experiment. In such work it is essential to make sure that the hives used are of standard strength.

Contagious Abortion

can be prevented

The Department of Agriculture recommends that every heifer calf should be vaccinated against contagious abortion. Farmers wishing to enjoy the benefits of Calfhood vaccination should consult their veterinarian or a Livestock Instructor as early as possible.

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Yields of White Clover Seed

Agriculturists in the U.S.A. consider that 1 or 2 hives per acre of crop are necessary for efficient pollination of white clover grown for seed. Hives are built up to this number on the farms of progressive seed growers, who pay beekeepers a pollination fee for their hire.

In western States of the U.S.A., where honey bees are used extensively on ladino clover seed fields, from 250 to 600 lb. of seed per acre may be produced. Yields of some Louisiana seed growers who also hire hives for pollination reach 300 to 400 lb. per acre.

It should be clearly understood that these figures do not indicate the average yield obtained in the U.S.A., but that of farmers who specialise in seed production with the aid of intensive pollination by honey bees. Thus the average yield of white clover in 1954 for the State of Idaho was 255 lb. per acre. A recent average for the 10 main white clover producing States of the U.S.A. was only 105 lb. of seed per acre.

A New Zealand farmer who specialises in white clover seed production probably averages about 150 to 200 lb. of seed per acre. The type of soil, climatic conditions, and strains of clover grown in the U.S.A. are not the same as ours. In addition much of our clover seed is grown as a catch crop, the grower not specialising in seed production but simply closing up a field for seed when he considers it profitable. It is therefore admittedly very difficult to compare our yields of white clover seed with those of the U.S.A., but it would appear that our average yields of white clover seed are as good as or better than theirs.

Insufficient Bees

However, American seed growers who specialise in white clover seed production and use honey bees intensively for pollination apparently obtain much higher yields of seed than do our seed growers. A likely reason for New Zealand seed yields not reaching these peaks is that growers do not get sufficient bee coverage to ensure adequate pollination. Though white clover seed-growing areas are no doubt well supplied with hives from the viewpoint of honey production, there are insufficient for maximum seed production.

It seems very likely that growers could increase white clover seed production considerably if hive concentration per acre could be raised to a figure more in line with that recommended in the U.S.A. Such a large increase in hives would depress honey crops to an uneconomic level and could be attained only if the seed grower were prepared to pay the beekeeper to bring in extra hives to provide a pollination service. No seed grower would support such a service unless he were sure that it was a sound commercial proposition.

ORGANISATION OF POLLINATION SERVICE

Part of 20 acres of mixed white and red clovers on the Hermitage road in the Mackenzie Country. There are no hive bees here and seed set depends on pollination by the short-tongued bumble bee.

Pollination Service

Before a satisfactory pollination service could be built up in the seed-growing areas of New Zealand, the following steps must be taken:

Research

A programme of field research is essential to determine how many hives per acre are required for the effective pollination of the main seed crops.

This aim can be achieved only if we are able to find by observation during the flowering period of crops what levels of honey bee activity will give maximum, reasonable, minimum, or insufficient pollination, and when this assessment is linked with hive concentration per acre.

Cost Relationship

It will be necessary to translate the experimental results obtained into a practical cost relationship between beekeeper and seed grower. The seed grower will then have some idea of the extra profit to be expected for his outlay in hiring beehives.

Organisation of Beekeepers

If beekeepers specialised in the supply of hives for pollination, they would probably find it advantageous to form an association. This would protect and further their interests and ensure that seed growers received the fair treatment necessary for a sound business relationship.

The association could fix pollination charges and organise the supply of hives from its members to spare them unnecessary transport costs. Members would be advised of the most efficient way in which to use bees for pollination and could guarantee that the hives they supplied were of a standard strength and free from bee diseases. Eventually it might be necessary for such an association to acquire modern hive-loading equipment and employ an organiser.

When the author was in California recently he met Mr C. B. Read, Manager of the Valley Pollination Service, Bakersfield. Mr Read had developed a most efficient pollination service provided by the hives of a large group of Californian beekeepers whom he represented. Seed growers in California regard the provision of bees for pollination as just as essential as treatment of a crop with agricultural chemicals to control pests, manuring, or cultivation. In the same way that a New Zealand farmer rings up an aerial topdressing firm or arranges with a contractor to head a crop, his Californian counterpart rings up Mr Read and arranges for pollination.

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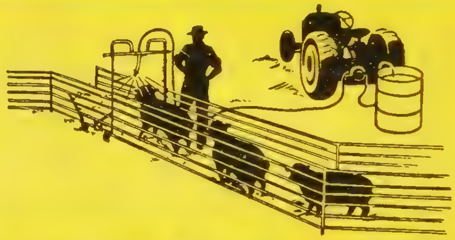

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Pollination Research

It may be many years before New Zealand beekeepers can hope to establish a pollination service on such ambitious lines as the Californian one, but it is obvious that both beekeepers and seed growers would benefit if bees could be used more efficiently as pollinators. Accordingly, the Department of Agriculture plans to carry out a series of field experiments in which the pollination requirements of our main seed crops will be investigated. As the most important seed crop is white clover, the pollination of this will be investigated first in an experiment planned to take place during the coming season near Timaru. The white clover experiment will be conducted on the following lines.

Hive Concentration

At the start of the flowering period one hive per acre will be put on a typical 25-acre white clover field shut up for seed. In the middle of the flowering period another hive per acre will be brought up, and finally when flowering has advanced still further an additional hive per acre may be added. If all these hives were brought to the site at once, before the field could support a high concentration of field bees, many bees would be likely to become attracted to competing sources of nectar. The hives will be distributed in five groups disposed to give even bee coverage of the site.

Bee Counts

Bees visiting the flowering crop will be counted at intervals throughout the flowering period, their concentration being expressed as so many bees per acre. In this way it will be possible to find what increase in field bees per acre occurs when extra hives are brought to the site. The most satisfactory concentration of hives per acre can then be deduced. It would not be worth while to bring an extra hive per acre to a crop unless a considerable increase in field bees per acre resulted.

Pollination Cages

These are large portable cages 6¼ ft. high, measuring 30 x 10 ft., and smaller ones 2½ ft. high, measuring 5 x 2½ ft. They are constructed of nylon mesh held in extruded aluminium frames bolted to a framework. The large cages cover a sufficient area for bees from a hive inside them to collect nectar and pollen from an enclosed crop. Eight small cages will be used to exclude all honey bees from random areas of the crop and two large cages to saturate areas with bees. The seed yield of these 10 areas, all on the experimental crop, will be compared with yields obtained there and elsewhere.

Marking bees with aluminium powder as they leave a hive to find what percentage of bees on a white clover crop come from an experimental apiary.

Seed Yield

The seed yield of the experimental area will be compared with that in as many similar control areas as practicable.

Pollination of White Clover Seed Heads

The percentage of florets which set seed on a white clover head is an index of how efficiently it has been pollinated. Heads picked at random on the experimental field and on control fields will be dissected and the florets and seeds counted so that the percentage of florets setting seed can be compared.

As the number of seeds per head varies much more than the number of florets per head, it will be necessary to use a large number of samples when working out the average seed yield per head in the experimental and control fields. The weight of seed harvested on the experimental field will be compared with yields from control fields.

Counts of Flowers

The number of clover flowers per acre in the experimental field and the control ones will be estimated by a method based on random counts of flowers in areas 1 ft. square. The results will enable an allowance to be made for different densities of clover flowers when seed yield from the experimental field is compared with that of the controls.

In addition, flower counts used in combination with the average seed yield per head of clover flowers will allow the theoretical seed yield per acre to be estimated for the experimental field and the controls. This will be of value as a check in cases where harvesting efficiency is reduced by circumstances such as adverse weather or unsuitable crop conditions. This calculation of the actual amount of seed set is of particular value in pollination research, because it allows seed yields of crops that are not harvested, or clover pastures, to be compared.

General

Bumble bees visiting the crops will be counted and identified as long- or short-tongued species. Pollen traps will be placed on hives in the experimental apiary so that the pollen the bees collect can be identified. Weather observations will be made.

The sugar concentration of nectar collected by the bees will be determined with pocket refractometers. This is important, as it is one of the factors which determines the attractiveness of a crop to bees.

The Mackenzie Country

Along South Canterbury's westward boundary are Mount Cook, Mount Tasman, and over 30 other peaks of more than 8,000 ft. Within the region there is an intermontane basin of about 250,000 acres the floor of which has a height of 1,200 to 2,500 ft. and is fairly flat over large areas. This basin is well known as the Mackenzie Country, named after James Mackenzie, the almost legendary figure who reached the area with a flock of stolen

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sheep in 1855 and was probably the first white man to set foot there.

The Mackenzie Country carries much tussock with its associated native plants and grasses. It is a country of long, cold winters and short, hot summers.

A recent development in agriculture of great interest to beekeepers and farmers is the successful establishment of clovers for the first time on much of the South Island high country such as the Mackenzie Country. The clovers, mixed with superphosphate, are dropped from the air or perhaps drilled in on the flat areas. A mixture of white, red, and alsike clovers is generally used. All these clovers provide nectar and pollen for honey bees. The clovers are required both for enriching the soil with nitrogen so that grasses can be grown and also themselves to provide grazing for stock.

It was realised by the farmers and others who conducted the first trials of oversowing of tussock with clovers that efficient pollination of the clovers was essential so that seeds could be spread by sheep or headed on the flat parts of the farms for sowing elsewhere. But the Mackenzie Country is virtually without honey bees, as its rigorous climate, isolation, and scant nectar sources make it unattractive to beekeepers. No commercial beekeeper would bring hives into the area unless paid a pollination fee.

In early January 1957 Mr F. W. Bartrum, a commercial beekeeper of Pleasant Point, moved the first hives of bees to newly established clover pasture in the Mackenzie Country. The hives were brought in for pollination only under an arrangement between Mr Bartrum and Messrs O. P. and J. Gibson. Gibson Bros. and Mr P. J. Gibson sen., now retired, run a very large Merino sheep station on the shores of Lake Pukaki. They had carried out a vigorous policy of sowing clovers and were well aware of the need for adequate pollination.

The hives were established in two apiaries, one on the Hermitage road and the other 1½ miles further inland. When the hives were moved in there was a lush growth on 1,200 acres of tussock country recently oversown with clovers, much of it within range of the hives.

The area was visited in February, when most clover heads picked at random up to ¼ mile from the apiaries were well seeded and those still flowering were attracting bees. Manuka in the Lake Pukaki area is severely affected with blight and there are few other sources of nectar and pollen, so bees would give their undivided attention to the clovers.

Pollen Analysis

Pollen may be brought into a hive by bees either directly as a food for their larvae or on the bodies of nectar gatherers. If pollen and honey samples are removed from a hive and the pollen grains are identified, the plants the bees have been visiting and so pollinating can be determined. Pollen analysis of honey samples removed from both apiaries on the Lake Pukaki farm showed the presence of large quantities of white clover pollen grains; red clover pollen grains were also identified. The presence of these grains is an indication of pollination of the flowers.

An apiary in the Mackenzie Country, where mixed clovers have recently been sown extensively from the air. This has resulted in hives being brought in to provide pollination.

Bumble Bees

In the coastal areas and plains of New Zealand where most white clover and other seed crops are grown so few bumble bees are present that they are of negligible value as pollinators, and honey bees alone must be relied on for effective pollination. Thus practically no bumble bees were seen on two white clover seed crops at Te Awanga, near Hastings, during observations extending throughout December; when conditions favoured activity honey bees reached densities of 1,200 to 3,000 per acre. The position has been found to be similar in other parts of New Zealand.

The reduction of bumble bee nesting sites through intensive cultivation, mortality through the use of insecticides, and lack of spring sources of nectar and pollen due to the use of weedkillers will tend to reduce still further the meagre bumble bee population in these areas. The introduction of new species of bumble bees would appear to be no solution of the problem, as the same adverse factors would operate against them. The only way in which effective pollination can be secured in such areas is by the use of sufficient colonies of honey bees.

The position is very different in the Mackenzie Country, where very high concentrations of the short-tongued bumble bee (*Bombus terrestris*), reaching one or more per square yard, have been found on clovers in summer. There is no doubt that the species plays an important part as a pollinator here and in other hill country areas where the factors which hinder bumble bee multiplication on the plains do not operate. However, bumble bee colonies are always weak in spring, are vulnerable to adverse weather, and cannot be built up in numbers as required. It is therefore unwise to rely solely on them for pollination even in areas, such as the Mackenzie Country, where conditions particularly favour their multiplication.

A farmer at Simon's Pass in the Mackenzie Country informed me that he obtained good seed yields from alsike clover if it flowered late in the season (after December), by which time the bumble bees had built up in numbers. Usually pollination was poor, because alsike generally flowers early in December, when there are few bumble bees. This farmer realised the advantages of hive bees as pollinators and was very anxious to pay pollination fees to any beekeeper willing to place them on his farm.

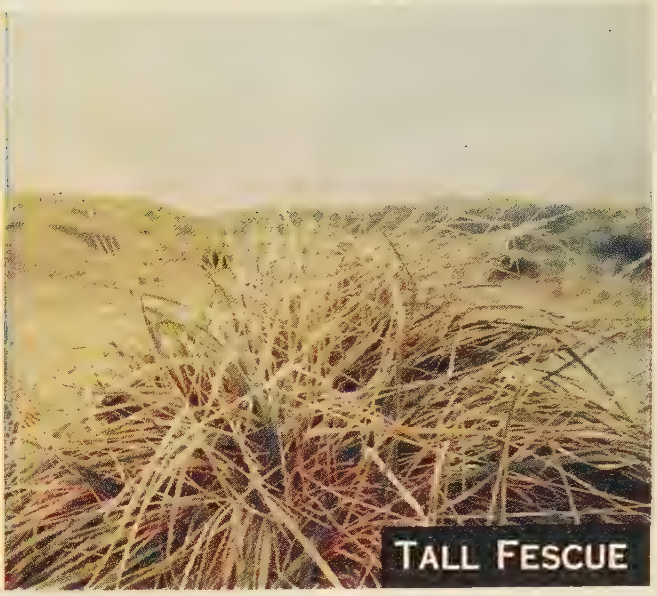
There is no doubt that the introduction of honey bees to the Mackenzie

(Continued at foot of page 24)

WEED IDENTIFICATION AND CONTROL

By D. I. GLUE, Instructor in Agriculture, and L. J. MATTHEWS, Weeds Research Officer, both of the Department of Agriculture, Wellington

This is one of a series of articles illustrated in colour to appear in the "Journal" from time to time in which identification and control of various weeds will be discussed.



TALL fescue (*Festuca arundinacea*) is a vigorous, tall-growing grass with coarse, broad leaves and a very extensive root system. In common with most other tall grasses it is encouraged by lax grazing, and so is widespread along roadsides, railway lines, and other areas not frequently grazed. As it is also favoured by moist soils it is widespread in swamps and on poorly drained land.

TALL fescue is regarded as a weed for the following reasons:

1. It is not very palatable and, if allowed to grow rank, soon smothers out the surrounding sward and assumes complete dominance. Though it is not a serious weed of high-producing pastures under good management, it is a persistent and vigorous invader where conditions are too moist for the better pasture species to thrive. In otherwise good pastures it is often found in low-lying areas which lie wet and pug badly during winter.
2. Cattle grazing tall fescue suffer from a disease similar to ergotism. They become progressively more lame and swelling of the fetlocks occurs, leading in a severe case to the sloughing of a foot or part of a leg.

Tall fescue has been eradicated from large areas of swampy land by drainage followed by clearing off of the top hamper of coarse growth by graders, fire, or grazing with horses, which do not show the symptoms of tall fescue poisoning. The areas have then been cultivated with giant discs or swamp ploughs and sown down with high-producing pasture mixtures, usually after a forage crop or a summer fallow.

Frequently small patches occur where cultivation is not possible. In recent years tall fescue on such areas has been effectively treated with chemical weedkillers.

Usually spot treatment of individual plants has proved most satisfactory Dalapon at 1 oz. to about 20 plants in sufficient water to secure complete foliage coverage has proved successful. The application should be made to new growth. Treating old, dead, or decaying leaves is not recommended.

The control with dalapon is best practised from February to late autumn.

If spot application is made, little damage is done to associated grasses and clovers. A wand with a single solid-cone 37M nozzle is satisfactory. If over-all application is practised, a rate of 15 lb. of dalapon to the acre should be used. This rate will destroy most grasses and severely check any clover present.

Since tall fescue cannot be controlled selectively with dalapon, chemical control should be limited to areas where cultivation implements cannot be employed because of adverse soil conditions or the presence of logs and stumps or fencelines.

Pollination Service

(Continued from page 23)

Country would be of great benefit to farmers aiming to establish and increase clovers. But unlike the position in most seed-growing areas of New Zealand the part played there by bumble bees in seed setting must be allowed for when assessing the value of hive bees as pollinators.

The seed yield obtained from an area of white clover visited only by bumble bees could be measured and compared with the yield of a similar area visited by both hive and bumble bees. In this way the value of both types of bee as pollinators could be determined.

Conclusions

Pollination of clover seed crops in New Zealand depends virtually on the honey bee. Bumble bees are important as pollinators in the hill country areas such as the Mackenzie Country, but at present these are not recognised seed growing districts. Therefore any programme aimed at increasing seed yields by improved pollination must depend on greater and more effective use of honey bees.

At present, pollination of clover seed crops in New Zealand is almost entirely fortuitous. Commercial beekeepers make their living by producing honey and so must place their hives in areas where bees can collect as much of a desirable type of honey as possible. Under such a system the high concentrations of bees considered essential for high seed yields are not attained. They will be reached here only when beekeepers find it worth while to provide a pollination service.

Already there is a growing realisation among seed growers of the necessity for adequate pollination and a consequent willingness to pay pollination fees, but a satisfactory pollination service must be based on research. It is hoped that the pollination research programme initiated by the Department of Agriculture will provide such a background and lead to mutually advantageous cooperation between beekeeper and seed grower.

Control of Grass-grub on Pastures

By A. V. ALLO,
Instructor in Agriculture, Department of Agriculture, Tauranga

MOST New Zealand farmers are familiar with the type of damage done to pasture by large numbers of grass-grubs. In such circumstances most of the grass is killed and the dead turf can be rolled up like a carpet. This type of damage is so obvious that no effort is required by the extension officer to persuade the farmer to use an insecticide to bring the grubs under control.

VERY few farmers are aware, however, of another type of damage associated with grass-grub, equally as serious but less obvious because it is insidious. This is found on the older, settled farm where there is a reasonable ryegrass content in the sward, but where the ryegrass lacks the vigour that could be expected from fertile country. The grass never seems to get away really vigorously; instead of autumn-saved pasture growing to 6 or 8 in., it has a struggle to reach 4 in. Recovery after grazing is slow.

Close investigation has shown that many of these problem pastures have a grass-grub population of from 6 to 10 grubs per square foot, a population too low to cause a spectacular baring of large patches but heavy enough to affect grass growth. In the warmer districts paspalum in a sward may mask the adverse effects of grass-grub. Damage is normally most severe on sunny slopes.

Grub's Life Cycle

It is important to understand the life cycle of the grass-grub. The adult beetle, commonly known as the brown beetle, is on the wing from November to early January, during which time it feeds on the foliage of fruit trees and crops and the leaves of several varieties of shrubs and shelter hedges. Large swarms of these beetles are often seen or heard while on the wing over this period. Eggs, large and white, are laid at least 3 in. in the soil, and the young grubs hatch out in 7 to 16 days to start feeding on the roots of many of this country's pasture plants. These grubs grow over summer, autumn, and spring, feeding voraciously all the time. A mature grub, creamy white to grey with a brownish head, is horseshoe shaped and about ½ to 1 in. long. The grubs remain within 2 or 3 in. of the top of the ground until September or October, when they burrow to a depth of from 4 to 10 in. to pupate, a new generation of beetles appearing in November to start another cycle.

Use of DDT

The insecticide most commonly used to control grass-grub is DDT, and this material **if properly used** will proof a pasture against grass-grub damage.

Several lines of DDT powder are available to farmers, and the quantity of each that is needed per acre depends on its p.p.i. (para para isomer) content. Pure DDT contains 100 per cent p.p.i., and lines commercially available vary from 85 per cent p.p.i. to 34.5 per cent p.p.i.

Amount

A panel of experts, including Mr J. M. Kelsey, New Zealand's foremost authority on grass-grub, considers that 1 lb. of 100 per cent DDT per acre should be used where there is likelihood of grass-grub attack but no definite knowledge that there will be such an attack. In other words, this dressing will be an insurance against grub attack and should be used particularly when new pastures are sown down. When a pasture has been attacked and grubs are working actively the application rate should be doubled to 2 lb. of 100 per cent DDT per acre.

As these are very small amounts of material to apply to an acre, the DDT must be mixed with a "carrier", generally superphosphate. Lime may be used, provided the lime-DDT mixture is not stored longer than 3 months. It is essential that the mixing be thorough. If the job is being done on the farm, the DDT powder and superphosphate should be mixed together in a concrete mixer, the mixer turning at 25 revolutions per minute for about 3 minutes. The mixture should be applied through a box-type topdresser and not through a blower, spinner, or by air; otherwise the fine DDT particles tend to separate and the application is very uneven.

Recently fertiliser works have introduced a "wet mix" DDT superphosphate, in which the DDT is mixed with the phosphate rock before the acid is added, the result being a far more evenly mixed and stable material. The DDT content varies according to the works making the material. It can be applied by air if the wind speed is less than 5 miles per hour and the altitude of the plane is not more than 150 ft. This gives an effective swath of 33 ft.

← The grass-grub.

↓ The adult grass-grub beetle.

DDT is also available in a pelleted form in which a film of DDT is bound on to a core of inert material. Three pelleted products are on the market. Two consist of very fine particles of wettable DDT on inert cores; the third consists of non-wettable technical DDT. The wettable types are quick in action, but the non-wettable type takes 12 to 18 months to get good control. A practical test to determine which type of DDT has been used is to shake up some of the pellets in a bottle of water. The fine, wettable DDT particles come off as a cloud within seconds, whereas the non-wettable granules remain practically unchanged. Pelleted DDT has been designed for aerial application, the DDT gradually washing off the core and becoming distributed throughout the ground. This material also should be applied at 1 to 2 lb. of 100 per cent DDT per acre, according to circumstances.

Other Insecticides

Other insecticides besides DDT will give satisfactory control of grass-grub. Benzene hexachloride (BHC) is one of these, and should be applied at 1 to 2 lb. of 100 per cent gamma isomer BHC under the same circumstances as 1 to 2 lb. of 100 per cent p.p.i. DDT would be used. DDT and BHC of the same particle size are equally rapid in action against grass-grubs. The former is preferred because it will give about 2 years' protection against both grass-grub and subterranean caterpillar, whereas the latter, though giving the same duration of protection against

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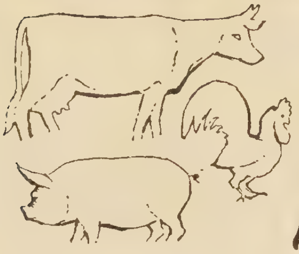

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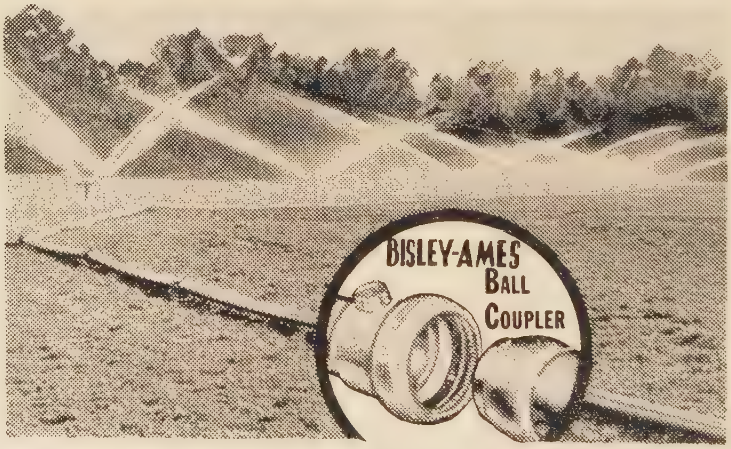

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grass-grub, will give only about 1 year's protection against caterpillar. DDT is also safer to use and cheaper.

Dieldrin at 1 lb. per acre gives a quicker kill of grubs than DDT at 2 lb. per acre and lasts as long in the soil for grass-grub control, but has to be applied yearly for caterpillar control. It is, however, more toxic to mammals than DDT and is more expensive.

Time of Application

No definite time can be stated as being best for the application of insecticides to pastures to control grass-grub. All farmers who have sown down areas of new grass in autumn after a crop should apply a dressing of DDT in the following spring. It is also a wise insurance to apply a dressing of DDT to any pasture that is being sod seeded; when grass is sown after grass DDT should be applied when the seed is sown.

Treatment for older pastures largely depends on the location of the farm and the farmer's finance. Any farm on a light, sandy soil is likely to have grass-grub, and regular application of insecticide would be warranted. The cost of 11s. 6d. per acre every second year is a cheap premium against grass-grub damage. In any case pastures should be watched in autumn for signs of damage and an insecticide applied immediately any appear.

Over March and April farmers are advised to go over the farm with a spade, digging spits of soil to see if any grubs are present. It should be remembered that the grubs will be working in the top 2 in. of soil. Grubs are small at that time of the year and may be hard to find. They are most easily found in winter and spring, when they have reached maximum size, but by this time the damage is done.

When grass-grub damage to a pasture is as severe as this it is easy to persuade the farmer to use an insecticide to control the grub.

▼ Few farmers are aware of grass-grub damage such as this, which is as serious but less obvious than that shown above and is caused by a grass-grub population such as that shown at right below and which was photographed in the same area. Such a concentration of grubs is too low to cause spectacular baring of large patches, but is heavy enough to affect grass growth.

CONTROL OF GRASS-GRUB . . .

Conditions for Application

Insecticides should always be applied to a dry, closely grazed pasture. It is no good putting them on to long, wet grass. They have to get into the soil, and farmers should try to manage their pastures so that conditions are such that this will happen as soon as possible after application. Stock should be kept off the treated area until a good, heavy rain has fallen.

Fertilisers containing insecticides should not be applied through a drill, as the coverage must be even over the whole surface of the paddock. A shuffle-feed topdresser is excellent for the purpose. If a star-feed topdresser is used, a spreader board should be fixed under the box to distribute the fertiliser evenly. Sacks should be hung behind the topdresser to prevent the fertiliser being blown away, and application should be done in calm weather.

Spraying not Recommended

One sometimes gets inquiries about spraying insecticides on to a pasture for grub control. Generally this practice is not recommended owing to the likelihood of the insecticide clinging to the herbage instead of getting into the ground. If, however, a farmer insists on a spray application, it is suggested that the paddock be hard grazed and the spraying done during rain. Most farmers use 20 per cent DDT emulsion, which would have to be applied at 4 pints per acre to give 1 lb. 100 per cent p.p.i. DDT. A large quantity of water should be used.

Control in Lucerne

In the Bay of Plenty young lucerne stands are sometimes badly damaged by grass-grub. To avoid this it is suggested that 2 lb. of 100 per cent p.p.i. DDT be applied to the paddock when the lucerne seed is sown.

Protection of Bees

Agricultural insecticides are highly toxic to bees and should not be applied to pastures containing many clover and weed flowers, especially if there are apiaries nearby; otherwise many bees may be killed.

The recommended rates of application of insecticides will not kill every grub in the soil. To do this would require considerably greater dressings than would be economic. However, the rates suggested will so reduce the grub activity that little or no damage will be done. As they are the minimum rates needed for satisfactory control, an even application of the material is vital. Again, grubs may still be found several weeks after the insecticide has been applied. This is quite normal; these grubs will be affected but not yet dead. They will not be feeding and will do no damage.

When applied at recommended rates insecticides do not harm earthworms and useful soil bacteria. They do not affect the germination of pasture seeds and will not affect grazing animals if applied according to Departmental recommendations.

It is firmly believed that grass-grub is responsible for more loss in pasture production than many farmers realise, especially on older, established farms where the damage may not be highly spectacular. Farms have more than doubled their production after the use of DDT and there are many cases of really spectacular improvement to pastures once the grub has been brought under control. It is of little use spending large sums of money on fertilisers and pasture-improvement projects if all the work is to be nullified because of the depredations of grass-grub

◆

Radio Broadcasts for Farmers

RADIO broadcasts for farmers during February will be given as follows:

1YA Auckland, 7.45 p.m.

4 February—"Control of Some Troublesome Grasses", by G. B. Haddow, Instructor in Agriculture, Department of Agriculture, Auckland.

11 and 25 February—Talk by officers of Animal Industry Division, Department of Agriculture, Auckland.

18 February—"Army Worms", by C. M. Blick, Fields Instructor, Department of Agriculture, Warkworth.

1XH Hamilton, 12.33 p.m.

9 February—"Facial Eczema", by O. V. Griffiths, Veterinarian, Department of Agriculture, Hamilton.

16 February—"Laying Down and Maintenance of Air Strips", by J. R. Murray, Instructor in Agriculture, Department of Agriculture, Hamilton.

23 February—"Meat and Wool Matters", by J. K. Ludbrook, Federated Farmers, Hamilton.

Regular Sessions

1XH Hamilton, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8 p.m. (Northland livestock report and "Farming for Profit"), Wednesdays at 8 p.m. ("Farming for Profit"), and Fridays at 8 p.m. ("News for the Farmer").

1YA Auckland, Mondays at 12.33 p.m., Tuesdays, Wednesdays, and Thursdays at 7.45 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m., Thursdays at 12.33 p.m.

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawke's Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawke's Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Mondays and Thursdays at 12.33 p.m.

4YA Dunedin, Mondays at 12.33 p.m., Tuesdays at 12.33 p.m., Wednesdays at 12.33 p.m. and 6.50 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m. Tuesdays at 12.33 p.m. and 7.15 p.m. (Lorneville and Gore stock market reports), Wednesdays at 12.33 p.m., and Thursdays at 12.33 p.m.

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Book Review

"Farm Engineering": A. W. Riddolls

THOUGH farming is one of the oldest of arts, its need for engineering practices in accordance with modern trends has been the basis of a large amount of published material. Much of this, however, has been concerned with the engineering aspects of overseas farming and little specifically applicable to New Zealand has previously been prepared.

Mr Riddolls's book is therefore particularly valuable in that it describes farm engineering for New Zealand conditions and is written by an outstanding authority on the subject who is the head of the Agricultural Engineering Department of Canterbury Agricultural College, Lincoln.

Engineering practices, principles, and techniques are dealt with in detail, covering subjects such as levelling, farmland drainage, water supply, irrigation, and concrete work. Two chapters are devoted to farm structures, covering materials, methods, and detailed arrangements for all types of farm buildings and such structures as sheepyards, hay barns, trench silos, septic tanks, fences, gates, etc.

The book is comprehensive and has much information on many aspects of engineering likely to be met in farming.

Production is clear and every subject covered is profusely illustrated with excellent plates.

This book is a "must" for every student of agricultural engineering and a valuable addition to the bookshelf of every farmer who requires the "know how" on engineering aspects of farming.

—H.W.T.E.

Government Printing Office, Wellington. 42s.

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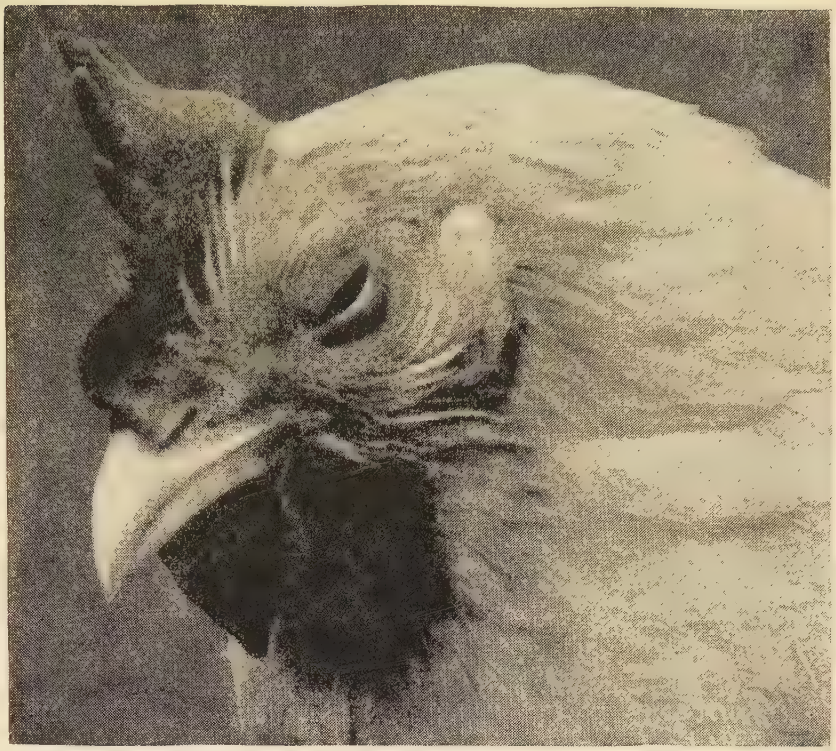
Vitamin Requirements of Poultry and Deficiency Disorders

POULTRY rations must be carefully balanced in protein, carbohydrates, and fat content if the birds' requirements for satisfactory growth and production are to be met. In addition accessory food substances, though needed in extremely small amounts, are essential. If rations are deficient in them or do not contain any of them, fairly definite disease symptoms may appear. In this article J. Edmondson, Poultry Experimentalist, Department of Agriculture, Upper Hutt, reviews the use of vitamins for poultry, particularly with reference to deficiencies which can occur under ordinary conditions in New Zealand.



Extreme vitamin A deficiency in a pullet; it is almost blind. Frequently the eyes of affected birds become swollen and may discharge.

VITAMINS are substances which are present in foodstuffs in relatively small amounts but which are absolutely essential for growth, reproduction, and the maintenance of bodily health. Our knowledge of these accessory foods steadily increases as new vitamins are isolated and identified.

When a new vitamin is recognised and added to the ever-growing list it does not necessarily mean that we have something new in nutrition and that diets will be improved. Often such findings are of only academic value, the vitamin identified being present in liberal quantities in normal poultry foods.

Of the mass of information emerging from considerable research into poultry nutrition, relatively little need concern the poultry farmer. As many of the vitamins known to be essential to poultry are present in sufficient amounts in normal rations used in New Zealand, these will be ignored and emphasis placed on those likely to be short. The three vitamins most frequently found to be deficient are vitamins A and D and riboflavin (vitamin B_2).

Acute Deficiencies

A prolonged vitamin deficiency can usually be recognised as a nutritional deficiency disease with characteristic symptoms. Such a deficiency, once recognised, can often be treated effectively and steps can be taken to prevent a recurrence.

How Vitamin Deficiencies Show up in Poultry

VITAMIN A		
	Chicks	Weakness and staggering gait, ruffled feathers, depressed growth
	Adult birds	Inflammation of eyes and pustules in mouth and throat
VITAMIN D_3		
	Chicks	Lameness, stilted walk, rubbery beak and bones, big joints, rickets
	Adult birds	Low hatchability, brittle bones, thin-shelled eggs
RIBOFLAVIN		
	Chicks	Curled toe paralysis
	Adult birds	Low hatchability, "clubbed down" appearance in embryo

Marginal and Partial Deficiencies

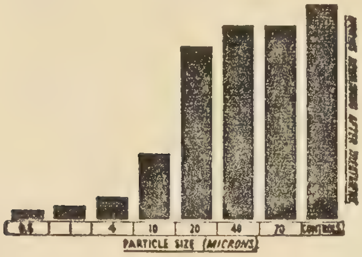
However, where there is only a partial deficiency, a very different and often confusing picture emerges. There may be no recognisable symptoms and yet a serious economic loss may result through lowered productivity, slower growth, or decreased resistance to infectious disease. An outbreak of infectious disease may occur which in reality may be partly due to, or increased in severity by, a partial vitamin deficiency. The outbreak is treated, but the predisposing cause is not recognised. Partial or marginal deficiencies are probably more widespread than is generally realised. Often an overhaul of a ration is preferable to the use of a drug included to prevent the appearance of some specific disease.

Marginal deficiency may sometimes produce no ill effects under normal circumstances. If, however, birds are subjected to an element of stress, such as below-average management, overcrowding in the house or at the food trough, exposure to disease, and so on, nutritive requirements are increased

TARTAN

topics

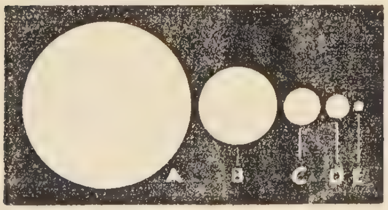
phenothiazine



This is a reproduction of a graph produced by the Animal Research Station, Wallaceville, to illustrate the efficiency of fine particle phenothiazine against worms in sheep.

TARTAN FENODREN liquid has a median or average particle size by weight of 3 microns (1/8000th of an inch!), and the above graph shows the high order of efficiency of phenothiazine within this size range.

When you get down to comparing these fine sizes, a microscope is necessary to compare the degree of fineness. However, the following diagram shows the particle size of some everyday materials on the same scale as typical particles of TARTAN FENODREN. For example, flour, fine by normal standards, has a particle size which would not be classed as a satisfactory average in an efficient phenothiazine product.



A: Particle of typical flour. *B:* Particle of face powder. *C, D & E:* Typical size range of Tartan Fenodren particles.

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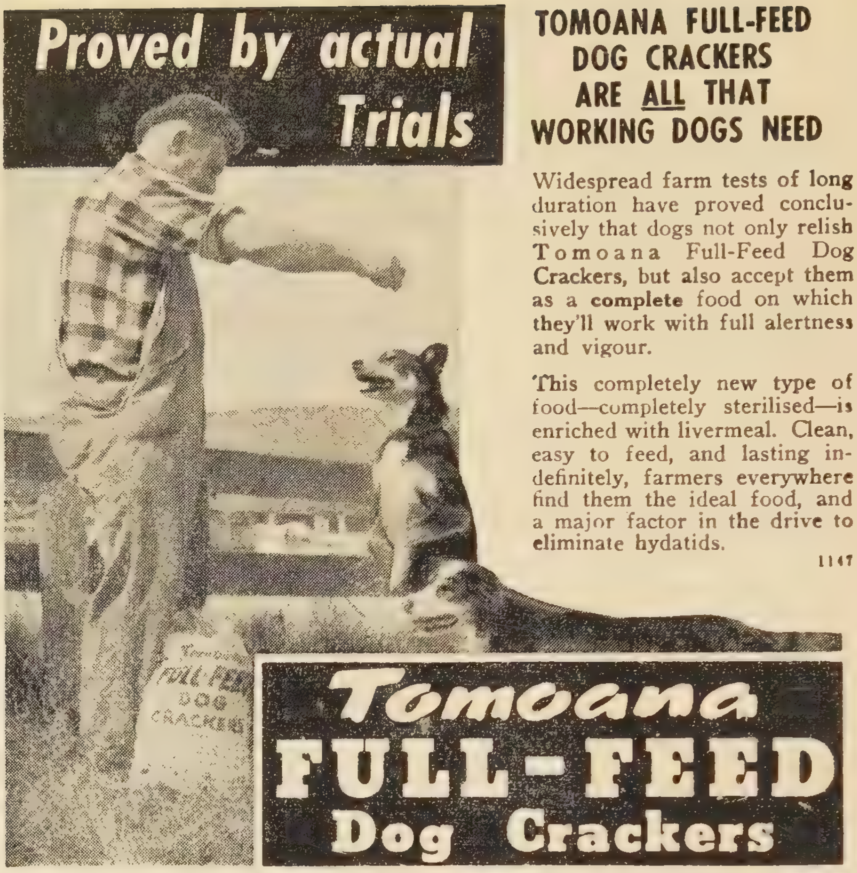

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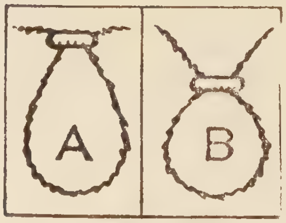

After placing ring on the purse DO NOT leave close to body as in sketch A.

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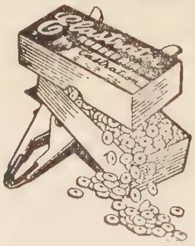
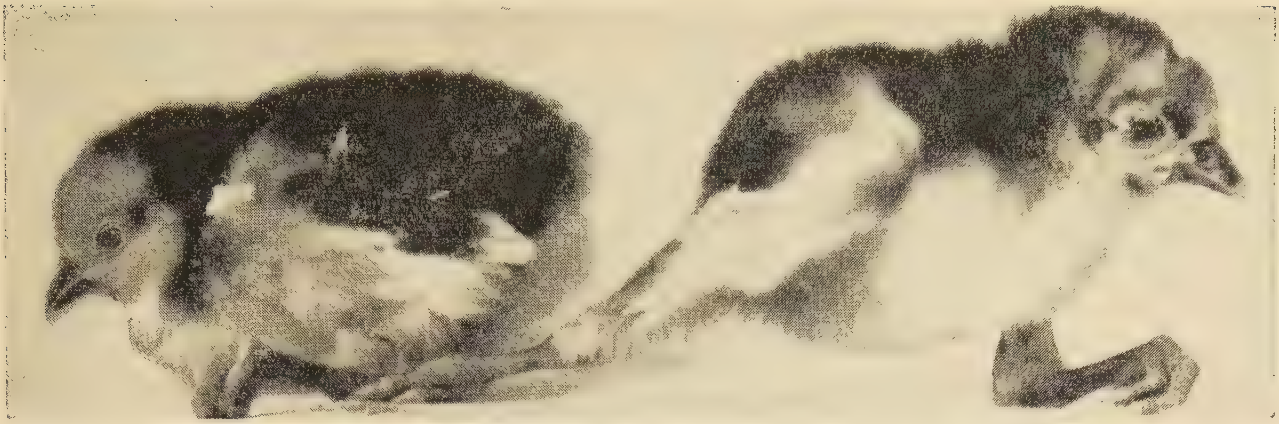




Leg weakness and curled toes in chicks resulting from riboflavin deficiency.

and the diet fails to meet the additional demand made on it.

Allow for the Feeding of Grain

Recommended allowances of food nutrients are expressed as a level **in the total diet**. A mash designed as an all-mash ration and containing the right amounts of added vitamins would be unsuitable for feeding with grain. The addition of grain, fed either separately or added to the mash, would considerably lower the overall level of supplementary vitamins in the resultant ration of mash plus grain.

A grain balancer mash suitable for feeding with equal parts by weight of grain would require roughly double the amount of added vitamins compared with a mash fed without grain. Estimate the proportions of mash and grain to be fed and fortify the mash to compensate for the diluting effect of the grain. Where a compounded mash is used follow the manufacturer's recommendation on grain feeding closely.

Mix Vitamins Thoroughly

There are unfortunate instances where supplementary vitamins have failed because they have not been evenly distributed throughout the mash. This applies particularly to high-potency vitamin products required in minute quantities.

The most efficient way of ensuring an even spread through the mash is to make a premix: add the vitamin concentrate to a small quantity of food such as maize meal and mix thoroughly; keep adding more food and mixing until the premix represents about 2 per cent. of the total quantity of mash to be mixed.

Vitamin A

Vitamin A promotes appetite, digestion, and growth and increases resistance to parasites and disease. It is essential for full production and hatchability.

A chick at hatching time has sufficient vitamin A to last for about 2 weeks, so that a deficiency will not begin to show until the chicks are at least 2 weeks old. If the parents' diet was deficient, resulting in a poor carry over of vitamin A through the egg to the chick, deficiency symptoms may appear earlier.

Evidence of a severe deficiency is failure to grow after the third or fourth week of age. Feathers are ruffled and the eyes are raw and may be gummed up. The chicks tend to weave about and finally are unable to stand. Mortality is usually very high.

Adult birds show signs of respiratory and nasal catarrh with a clear discharge which later thickens as secondary bacterial infection occurs, often causing the eyes to become greatly swollen. This condition is referred to as nutritional roup. Examination reveals numerous yellowish white pustules on the back of the throat and oesophagus, which are easily scratched off and do not bleed as with fowl pox canker. Affected birds stop laying and have a dejected, unthrifty appearance.

A mild deficiency results in poor growth, susceptibility to colds, coryza, and parasitic infestations such as worms and coccidiosis.

Sources of Vitamin A

Good sources of vitamin A are fish oils, synthetic vitamin A, and carotene. Carotene is a precursor of vitamin A (provitamin A) which can be converted into vitamin A in the bird's body.

Provitamin A (Carotene)

Grass, clover, lucerne, carrots, yellow maize, and other green vegetables are good sources of provitamin A. Fairly rapid loss of it takes place if fresh-cut greens are stored before being fed, particularly in warm weather, or if they are allowed to heat.

The vitamin A value of dried green products, such as grass and lucerne, varies considerably, some samples being almost valueless but others quite good. Much depends on the stage of growth at which the material is cut and also the method of drying. The younger the growth is the more nutritious is the meal, and an artificially dried sample is better than one which is sun dried.

Colour is a useful guide to the value; rich green samples are best. The most reliable method of purchasing a lucerne meal is on analysis. Choose a sample having not less than 120,000 international units of vitamin A activity per pound, not less than 17 per cent of protein, and not more than about 20 per cent of fibre.

Green food is also a useful source of riboflavin and a number of other vitamins, including pyridoxine, vitamin E, vitamin K, pantolthenic acid, and folic acid. It also contains a pigment (xanthophyll) which is responsible for egg yolk colour; 4 per cent of good dehydrated green food in the ration will be sufficient to maintain good colour. A poor meal is useless.

Vitamin A Supplements

A most important natural source of vitamin A is fish liver oils, some of which contain as much as 500,000 international units per gramme. Until about 1952 fish oils were used almost exclusively in this country as the source of supplementary vitamin A. Probably the biggest disadvantage with fish oils was the loss of vitamin A potency, particularly when the oil had been mixed with the food. This meant that the oil could not be stored for long and when it was mixed with mashes they had to be used within a short time.

Where oil is used it is necessary to keep it in a cool place and well stoppered to prevent exposure to air and consequent oxidation of vitamin A. Once it is mixed in the mash this should be used within about a week, as the oil can lose as much as 70 per cent of its potency in 10 days. Emulsions of vitamin A oils can be mixed with water in the drinkers or in the water used for mixing wet mash.

In recent years there has been a big swing over to dry stabilised vitamin A, particularly by poultry food manufacturers. The process used in the preparation of dry stabilised vitamins is usually to coat the particles derived from natural fish oils or synthetic sources with starch, gelatine, or other suitable material. Anti-oxidants are often used as an additional preventive of oxidation. Vitamin A stability and uniformity of the product when mixed in the mash are usually guaranteed for 4 months by reliable makers.

As the potency of vitamin A preparations varies according to the make, it is advisable to follow the maker's instructions on feeding level and method of mixing. The potency should be stated clearly on the label of the container. Chickens and growing stock require 2,000 international units per pound of total food consumed and adults 3,300. These figures include a safety margin of 60 per cent.

Vitamin D

Vitamin D is associated in most people's minds with vitamin A, probably because they occur together in fish oils. This vitamin controls the assimilation of calcium and phosphorus in the ration and is a regulating factor in mineral metabolism. It prevents rickets and the laying of thin-shelled eggs and increases egg production and hatchability.

There is a carry over of vitamin D from the egg to the chick. The production of vigorous chicks demands adequate amounts of vitamin D in the diet of the breeding stock.

Vitamin D deficiency is usually fully evident by 3 to 4 weeks of age, but may be observed earlier when there is a deficiency in the breeders' ration. The chicks are retarded, showing a disinclination to walk and do so with a stiff-legged, ungainly gait. There is an enlargement of the hock joints, the beak is soft and rubbery and may easily be bent, the bones are soft (failing to crack when bent), and there is a beading of the rib endings on the side of the breast.

In adult birds the first symptom of vitamin D deficiency is the laying of thin-shelled eggs followed by decreased egg production. The bones of the legs and wings become fragile and break easily and there may be temporary loss of use of the legs. Hatchability is adversely affected and poor chicks are produced.

Though rickets is often caused by a deficiency of vitamin D, the disease may also be caused by a lack of available calcium or phosphorus in the diet. It is advisable therefore when rickets occurs to check that vitamin D content and also the mineral balance of a diet are satisfactory.

Forms of Vitamin D

There are a number of forms of vitamin D, that required by poultry being vitamin D_3. This occurs in fish liver oils and irradiated animal sterols. The potency of D_3 preparations for poultry is usually expressed in international chick units. Where it is given in A.O.A.C. (Association of Official Agricultural Chemists) units the value must be reduced by 25 per cent. to get the equivalent in international chick units.

Methods of Supplying Vitamin D

In the presence of sunlight birds can manufacture their own supply of vitamin D_3. The ultra-violet rays in sunlight impinge on organic substances in the skin known as sterols, synthesising vitamin D_3. The natural synthesis can be simulated by exposing them to lamps giving off ultra-violet rays. Though effective, this method is not economic.

Fish liver oils are normally rich sources of vitamin D_3 and concentrates of extremely high potency may be prepared from them. Blended preparations of stabilised vitamins A and D_3 are commonly used.

Synthetic vitamin D_3 is produced by the irradiation of the animal sterol cholestrol. The synthetic vitamin is just as effective for poultry as that in fish liver oils and is often referred to as activated or irradiated 7 dehydrocholestrol.

Chickens and other growing birds require 135 international chick units of vitamin D_3 per pound of food in the total ration and layers and breeders 340. These figures include a 50 per cent. margin of safety.

Riboflavin

Riboflavin, also known as vitamin B_2, is closely associated with the release of food energy and the assimilation of nutrients. It is essential for good growth, reproduction, and vitality. A deficiency often causes poor hatchability. Compared with layers and growing stock, chickens and breeders have a particularly high requirement of riboflavin.

Symptoms of riboflavin deficiency in the chicks' diet usually appear at about 3 weeks of age. There is diarrhoea and poor growth followed by curled-toe paralysis, the chicks walking on their hocks with the toes curled inward. Mortality will depend on the extent of the deficiency.

The riboflavin requirement for hatchability is considerably above that necessary for egg production and health. If a breeders' ration is moderately deficient in riboflavin, many embryos die during the second week of incubation. Dead embryos have a typical "clubbed down" appearance. The downy feathers instead of breaking through the transparent sheath in which they are enclosed remain encased and curl round themselves in tight little knots which look like small white knobs scattered over the embryo chick.

Dried yeast, liver meal, milk products, and good fresh or dehydrated green foods are all good sources of riboflavin. It can be produced synthetically, and relatively cheap supplies are available. Synthetic riboflavin is often incorporated in vitamin A and D_3 preparations in correct proportions for inclusion in poultry foods.

Under normal feeding conditions a layers' and growers' mash supplemented with good green food fed fresh or included in the mash dehydrated at 4 to 5 per cent of the total diet (mash plus grain) should meet riboflavin requirements. Where 5 to 6 per cent of milk powder is used in chick and breeder rations in addition to a good supply of green food a deficiency of riboflavin is not likely. Synthetic riboflavin is commonly included in chicks' and breeders' rations as an insurance against possible deficiencies.

As cereal grains have a very low riboflavin content, the tendency to overfeed grain when using a correctly compounded food is probably one of the most common causes of riboflavin deficiency.

Recommended allowances of riboflavin per pound of food are: Chicks up to 8 weeks, 1.6 milligrams; growing birds, 1; layers, 1.2; breeders, probably as high as 2.

Wool Sales

The dates and venues of main wool sales until the end of March are:

9 January: Wanganui.
14 and 16 January: Auckland.
21 and 23 January: Napier.
28 and 30 January: Wellington.
9 and 11 February: Christchurch.
16 and 18 February: Invercargill.
23 and 25 February: Dunedin.
2 March: Timaru.
11 March: Wanganui.
16 and 18 March: Auckland.
23 and 25 March: Napier.

Ram Fairs

The following are dates and venues of ram fairs up to 9 March:

19 January—Wairoa at Wairoa.
19 and 20 January—Masterton at Masterton.
27 and 28 January—Feilding flock at Feilding.
5 February—Canterbury stud at Addington.
12 and 13 February—Canterbury flock at Addington.
13 February—Dannevirke at Dannevirke.
13 February—Ohura at Nihoniho.
24 February—Otago at Dunedin.
5 March—North Otago (mutton breeds) at Oamaru.
9 March—North Otago (wool breeds) at Oamaru.

Storage Dam for Pump Irrigation Water

TO reduce irrigation costs by pumping water when the cheaper night rates for electricity apply, Mr J. Kinney, of Hyde, Central Otago, has made use of a circular dam on a hilltop to store irrigation water which is later used for daylight irrigation, as described in this article by W. A. Lunn, Fields Instructor, Department of Agriculture, Ranfurly. This type of dam was widely used by early miners throughout the goldfields and has recently been developed in Australia as a "turkey nest" dam for low-cost water storage or "water harvesting" during heavy rainfall and subsequent use through irrigation sprinklers.

Upper—A section of the "turkey nest" dam partly filled with water pumped from the Taieri River. Lower—The pumphouse (lower right), the pipeline, and the shed housing the switching gear (upper left).

THIS type of dam can often be placed in a more favourable position to command a larger area for irrigation than can a gully dam, provided the soil contains a reasonable percentage of clay to assist consolidation and to prevent leakage.

The dam on Mr Kinney's property is 90 yds. in diameter and was constructed entirely by a bulldozer pushing spoil outward to form a circular dam. The cost of bulldozing was £170.

Water is pumped 170 vertical feet from the Taieri River through 750 ft. of pipeline. The pipeline comprises 130 ft. of 10 in. and 11 in. steel pipe which raises the water 80 ft. in one stage, 320 ft. of 9 in. high-pressure concrete pipe which raises the water to the 150 ft. level, and 300 ft. of 9 in. low-pressure concrete pipe which raises the water through the remaining 20 ft.

A 40 h.p. 3-phase electric induction motor operates a 4 in. high-lift pump capable of delivering 400 gallons per minute to a height of 250 ft. A time switch operates the pump from 10 p.m. to 7 a.m., during which period electricity charges are lower.

The dam has a capacity of 1½ million gallons and is filled after 7 nights' pumping. Daylight irrigation uses about 2 cusecs of water, a proportion of which is replaced each night by the pump.

At this rate the dam can supply sufficient water for 10 days' irrigation.

Details of irrigation labour and operating costs are not given here, as these would be different for each irrigation scheme. Eventually an area of up to 250 acres could be irrigated, with an estimated increase of 500 ewes, which would double the previous carrying capacity. Because of the high lift and the nature of the country, the scheme has been made possible only by the construction of the hilltop dam to take advantage of the cheap night rates for electricity.

Mr Kinney and his two sons have done all the work except the bulldozing of the dam and the electrical installations.

In the immediate future the area irrigated will be 150 acres. The cost of installation for the 150 acres, including the pump, motor, pipeline, the electrical equipment, and the dam, has been £8 10s. per acre. This figure would be considerably higher if the work had been done by hired labour or by contract, and the scheme is a good example of what can be achieved in reducing costs by sound planning and initiative.

Care of Livestock during February

Contributed by the Animal Research Division

PREPARATIONS FOR TUPPING

IF ewes have been held on short pasture since weaning, they should now be in good, hard condition. About 21 days before tupping they should be crutched and given the best pasture available. Experiments at the Department of Agriculture's Ruakura Animal Research Station have shown that flushing ewes for 3 weeks before tupping and keeping them on good pasture for 3 weeks after tupping begins increases the number of lambs marked by 20 per cent. Rams, too, should be crutched and flushed for about 3 weeks before tupping. They should be dipped before this flushing period, as dipping too close to tupping appears to reduce ram fertility.

PULLORUM DISEASE IN POULTRY

Preparations should now be made for the autumn hatch by blood testing the flock for pullorum disease and by cleaning and fumigating the incubators. A vacuum cleaner is ideal for cleaning and advice on fumigation may be obtained from the local Poultry Instructor.

CARE OF CALVES

The autumn is a critical period for calves. Deaths during winter can be eliminated by rotating the calves through the paddocks ahead of the cows at intervals of 3 or 4 days. If this is not being done, it should be begun immediately. Calves so treated will be up to 100 lb. heavier as yearlings than those kept confined in a calf paddock. If calves are unthrifty and scouring, it may be necessary to give two or three doses of phenothiazine at 3-weekly intervals, but this is seldom necessary with calves which are rotationally grazed.

FACIAL ECZEMA

If warm rains fall in late summer or autumn after a spell of hot weather, facial eczema is likely to occur in districts which are usually affected. Experience during recent years has conclusively shown that the disease can be prevented by shutting sheep up at a rate which leaves no pasture in the paddock after 24 hours. Sheep should be shut up as soon as rains fall and should be confined until the weather becomes either hot and dry or much cooler and the pasture visibly hardens. If the summer is hot, plans should be made for action along these lines. Good hay at 2 lb. per sheep per day will prevent loss of condition. Even if adequate hay is not available, ewes are not harmed by 1 or 2 weeks' starvation when ample water is provided. It is better to take precautions too often than to run the risk of a disastrous outbreak of facial eczema

If crops of rape, kale, turnips, or chou moellier are available, they can safely be grazed during the dangerous period. The grazing of such crops is the only satisfactory way of preventing the disease in lambs, which react badly to restricted grazing. Lucerne has not proved safe, possibly because of ryegrass which is frequently present as a weed, but in the North Island east coast districts paddocks of pure white clover are safe and lambs do well on them. A bulletin giving full details of the cause and prevention of facial eczema is available from all offices of the Department of Agriculture.

COBALT DEFICIENCY

Bush sickness can be completely prevented by topdressing annually with cobaltised superphosphate, and in the North Island at least this is best applied in the annual autumn topdressing. Cobaltised superphosphate prepared in North Island works contains 3 lb. of cobalt sulphate per ton. Two hundredweight of this fertiliser contains sufficient cobalt for 1 acre. In the South Island cobaltised superphosphate contains 6 lb. of cobalt sulphate per ton, and 1 cwt. of this contains sufficient cobalt for 1 acre. If greater quantities of fertiliser than those indicated above are used, the additional amount need not be cobaltised. For fuller details consult the Department's Bulletin No. 180, "Cobalt Deficiency in Sheep and Cattle".

COPPER DEFICIENCY

Scouring in cattle and staggering in lambs grazing on peat and other copper-deficient land can be prevented by topdressing the pastures in autumn with 5 lb. of bluestone per acre. Copperised superphosphate is now available, or the bluestone may be mixed with lime. For fuller particulars the Department's Bulletin No. 238, "Copper Deficiency in Cattle and Sheep", should be consulted. Where topdressing is not practical injections of copper cerate can be used.

BOVINE INFERTILITY

Infertility may be due to several infectious diseases which are known to be present in New Zealand. Reliable tests for these are now available. If more than the usual number of cows are still empty, veterinary assistance should be sought promptly.

SOWS AND WEANERS

Sows with litters should be fed at the rate of 4 gallons of milk plus 2/3 gallon per pig suckled. Sows and litters should be allowed at least 2 hours' grazing per day. It is an advantage to provide water sprays for both suckling and dry sows during summer; since pigs possess very few sweat glands, they can be kept cool only by the evaporation of water from the skin. Litters over 3 weeks old must have milk and meal available at all times. Observations at Ruakura have shown that piglets suckle at intervals of 75 to 90 minutes throughout the 24 hours and after the sixth week visit the creep after each suckling. Good creep management can add 6 to 10 lb. per pig to the weaning weight.

Weaned sows must be well fed to ensure successful mating. A ration of 4 to 6 gallons of milk daily plus grass is essential.

Weaned pigs should be fed 1½ to 2 gallons of milk daily. If the milk available is not sufficient to provide this, the feeding of meal to supplement the milk ration, 1 gallon of milk being replaced with 1 lb. of meal, is highly profitable at the present meal and meat prices.

VITAMIN A FOR GROWING AND LAYING BIRDS

Vitamin A is essential to poultry for protection against various infections, particularly colds and contagious catarrh. Poor egg production is a common feature of an inadequate supply of vitamin A to laying birds.

Green feed is a useful source, but at certain periods of the year when this becomes scarce or poor in quality it may be of little value. Growing birds on open range may suffer from vitamin A deficiency during very prolonged spells of dry weather. Though there is apparently plenty of green feed available, it may be of very poor quality. The addition of one of the several vitamin A-rich products on the market such as synthetic vitamin concentrate power, emulsion, or fish oil, when good-quality green feed is not available, is advisable for both growing and laying birds. The amounts used vary according to the product selected and the age of the birds to be fed. The quantity advised by the manufacturer of the product should always be used when adding a vitamin supplement to the diet. Further advice on the use of vitamin A supplements may be obtained from the local Poultry Instructor of the Department of Agriculture, and a special leaflet on the subject is available.

Seed for New Pastures: Lucerne for Grazing

Seasonal Notes by the Extension Division

SEED FOR SOWING PASTURES

FARMERS should choose a pasture seeds mixture which experience and trial work have shown to be suited both to the district and to the purpose for which it is required. If in doubt, a farmer should consult the local Instructor in Agriculture. "Shotgun" mixtures are wasteful and expensive. The quality of the seeds in the mixture, including such factors as strain, purity, and germination, is also important.

Within species of plants there occurs a wide diversity of types, some of which are superior to others. These good strains of seed have been isolated and multiplied under the Department of Agriculture's certification scheme. Only by buying certified seed can you be sure of getting these superior strains.

Seeds are bought and sold largely on a basis of purity and germination. When the purity of a line of seed is being evaluated both the percentage of pure seed present and the nature of the impurities should be considered. Examine the certificate not only for the total quantity of weed seeds but for the kinds of weed seeds present. A trace of seed of a serious weed in a line of otherwise good pasture seed often outweighs its advantages, particularly if the farm is free of this weed.

The germination count gives a guide to the strike which can be expected. Since a rapid strike is essential in pasture sowings, take note of the interim count, which measures the vigour of the line or the speed with which it will germinate. In general, lines with high interim and final counts are to be preferred to lines with low interim counts but high final counts. Lines of ryegrass seed of lower final germination but with the interim count similar to the final count are quite suitable provided the price of the seed is adjusted according to the germination percentage. If the certificate is more than 6 months old, it is wise to request a further analysis before purchasing.

—*M. L. CAMERON, Timaru*

* * *

LUCERNE IN THE SOUTH ISLAND

LUCERNE is a fodder crop capable of high production over a wide range of soils and climates; it is rich in minerals and protein and with its deep rooting system is well suited to growing in areas subject to summer drought.

Until recent years lucerne was grown primarily for the provision of hay and silage, but it can be maintained under grazing alone, and increasing areas are being grown throughout the South Island for hay and grazing. It begins spring growth before conventional pastures, maintains its production into the dry summer months, and is invaluable for grazing at these periods of shortage.

Lucerne can be grown successfully on practically all soil types provided they are moderately well drained and any mineral deficiencies are corrected. In the moist and cooler areas invasion by grass weeds, particularly browntop, can shorten the life of lucerne stands, but the chemicals dalapon and TCA can now be used for weed control. The advice of the local Instructor in Agriculture should be sought when treatment for weed growth is contemplated.

Lucerne is not a strong competitor with other plants, but it can be grown in combination with a palatable grass, provided the rate of sowing of the companion grass is kept to a minimum and the stand is managed to keep the grass from dominating the lucerne. With the more aggressive grasses this can be achieved best by hard winter grazing. Recent work indicates that this winter grazing should be undertaken during early winter—up to mid June—if the subsequent spring growth of the lucerne is not to be affected. The grasses most commonly included are cocksfoot, *Phalaris tuberosa*, timothy, and prairie grass.

—*R. A. MILNE, Rangiora*

* * *

AUTUMN TOPDRESSING ON NORTHLAND DAIRY FARMS

ON all but land subject to flooding autumn topdressing is essential. The time of application will vary to a small extent from district to district but should be between February and April. While the normal dressing of up to 3 cwt. per acre is usually correct, there are times when an initial dressing of 5 cwt. is preferable to boost fertility rather than 3 cwt. in autumn and 2 cwt. in spring. Paddocks that are inclined to lie wet in spring are often better topdressed in autumn to save damaging the turf in spring.

Light land and country which dries out should be topdressed early. Part of the farm should be done before the autumn rains begin and the remainder as soon as rain has washed the phosphate into the ground.

Calving on the lighter country often starts in early June and unless topdressing is applied early, the best use of the fertiliser for autumn-saved pasture will not be made. A paddock should have about a 6-week spell between application of the fertiliser and the beginning of rationed grazing. This will usually mean that topdressing should be done at the beginning of March.

In this manner the best use is made of the autumn flush for both pasture and stock.

—*C. E. BALLINGER, Whangarei*

* * *

SUMMER CLEARANCE OF DRAINS

DRAINS cleaned in autumn by mechanical methods are usually choked with growth by the following spring, when efficient drainage is most needed. More efficient drainage can be obtained by using chemicals in addition to mechanical methods.

The problem can be attacked either by complete soil sterilisation or by dealing with emerging growth. Soil sterilisation is limited to drains which dry out during summer; monuron or diuron is the most efficient chemical for this purpose. These weedicides will keep most weed growth under control for up to 3 years, depending on the soil type, best results being obtained on the heavier soils.

Monuron is particularly effective for control of the bulbous weed known as Purua grass (*Scirpus maritimus*). The drain should be sprayed at up to ¼ lb. of monuron per chain during summer or autumn when the drain is dry. Paspalum and plantain are resistant to monuron and diuron, but fortunately paspalum does not normally extend below the winter water level and because it is dormant in spring it does not impede water flow during these critical months.

Emerging grassy weeds, notably reed sweetgrass (*Glyceria maxima*, formerly known as *Poa aquatica*), can be controlled very successfully with dalapon at 20 lb. per acre. For satisfactory results this weed must be sprayed during autumn (from February onward) with sufficient water to ensure a satisfactory cover. A fine spray should be used. A more rapid kill can be obtained by replacing half of the dalapon with amizol, but the final result is the same.

—*G. L. BANFIELD, Thames*

Mange in Pigs

By G. A. DURHAM,

Veterinarian, Department of Agriculture, Papakura

MANGE in pigs is a contagious disease of the skin caused by parasitic mites or acari (*Sarcoptes scabiei var. suis*). The disease is not uncommon in New Zealand and can cause considerable economic loss to the farmer. It is a notifiable disease under the Stock Amendment Act 1955 and suspected cases should be reported to the Department of Agriculture.

THE mange mites are exceedingly small, roughly a quarter the size of a pinhead. They are round or oval and a creamy or pale yellow colour. The mites are too small to identify readily with the naked eye and a powerful lens, or much better still a microscope, is required.

The adult mite has a flattened bulbous body, a head, and eight legs. The male has suckers on all legs except the third pair and the female has suckers only on the first two pairs, each of the other legs ending in a long bristle.

Adult mites burrow in the skin of their host, making tunnels in which the female mites lay their eggs, which go through various stages of development and eventually become adults. The life cycle, all of which takes place in or on the skin of the host, takes about 17 days.

Some mites may become transferred from the skin of an affected pig to pigsty walls, trough, or rubbing posts. These would die within 2 to 3 weeks.

Symptoms

The disease usually begins on the head in the region of the ears and gradually spreads over the neck and shoulders, then along the back and sides, until the whole body may be affected. The burrowing of the parasites causes an intense itchiness or irritation, which, incidentally, is far more intense than when pigs are infested with lice. Affected pigs are constantly scratching and rubbing themselves against pigsty walls, troughs, and posts.

The affected skin first becomes inflamed, reddened, and swollen and the hairs stand erect and finally fall out or are rubbed off. Eventually the skin becomes dry and covered with crusts and scabs. Constant rubbing and scratching often result in the formation of raw areas and cracks from which blood and serum exude. Secondary infection with bacterial organisms is common. In bad chronic cases the skin becomes wrinkled and thrown into folds. Frequently, when the skin is moist an offensive smell develops. As the disease progresses the animals become unthrifty and young pigs in particular may die in an emaciated condition.

Mange affects pigs of all ages and breeds, though young pigs are more commonly severely affected. Mites may be found in some adult pigs in the region of the ears and nowhere else. In these cases the disease may not become progressive, but such pigs are carriers and can pass the disease on to younger and more susceptible pigs.

Mode of Spread

Mange is usually introduced to a piggery by buying in a pig that is already affected with the mites. It then spreads from one pig to another either by direct contact or indirectly from contaminated walls, troughs, and posts.

Affected pigs tend to lose condition and become unthrifty and the disease frequently causes deaths in young pigs. There is some risk that at the works the carcasses may be down graded or even totally condemned.

As treatment is relatively simple and inexpensive, there is little excuse for the farmer not eliminating the disease should it break out in his piggery.

Diagnosis and Treatment

Mange is usually diagnosed by examination of scrapings taken from an active skin lesion. Microscopic examination of prepared scrapings will show the mites.

In the past some farmers have wrongly concluded that the skin lesions of mange have been caused by sunburn or diet.

Mange in pigs is a notifiable disease under the Stock Amendment Act 1955 and suspected cases should be reported to the Department of Agriculture. A Veterinarian or Livestock Instructor of the Department will call and after examination make a diagnosis.

Departmental control consists essentially in prohibiting the sale of affected pigs until they have been cured and in seeing that adequate treatment is applied to eradicate the disease from the piggery.

Treatment consists of a thorough application over the whole of the bodies of all pigs in the piggery of a BHC solution of suitable strength applied either by spraying or dipping and repeated at 10- to 14-day intervals. Three applications are usually sufficient to eliminate all mites.

Instead of trying to treat grossly affected pigs that are emaciated it may be better to send them to the boiling down works or kill and bury them.

The same BHC solution is quite efficient for spraying pigsties, troughs, doors, and posts. Alternatively, if a piggery could be left empty for 3 weeks, all mites in it would die a natural death.

An old-fashioned treatment for mange using oil, with or without the addition of sulphur, is not entirely efficient and is not recommended.

If a piggery is free from mange, it might be worth while to treat bought-in pigs with the BHC solution on arrival.

Warning

As yet the exact effects on pigs of the newer insecticides, aldrin and dieldrin, have not been determined and as in certain circumstances they can be poisonous they cannot be recommended.

Fire Protection for Farm Homes and Buildings

[*R. W. Orr*

THE incidence of rural fires is increasing and week after week newspapers carry reports of homes, farm buildings, and pastures destroyed by fire, sometimes accompanied by tragic loss of life. There is often evidence of failure to take simple precautions which could mean the difference between a minor incident and total disaster. This article sets out the measures that prudent farm property owners should take. Remember that farm buildings serve the dual purpose of home and business premises with a disruption to both if a serious fire occurs.

By G. DUNNACHIE,
Chief Fire Protection Officer,
Ministry of Works

COMPARE the farmer's situation with the town dweller when fire strikes: In cities piped water supplies, hydrants, push-button response by skilled firemen, and fire-fighting appliances are all readily available. The farmer has to fight the fire, save family treasures, possibly lead members of the family to safety, and decide which will receive priority. **He is on his own.**

Not that a farmer should be brooding constantly about fires; he has many other things to do, but he should be alerted to an attitude which will ensure minimum precautions being taken. The measures recommended are simple and practical, in keeping with known facts, and fall under two broad headings:

Fire prevention.
Fire fighting.

In isolated areas preventing fires is a more certain method than fighting fires, because of the lack of outside assistance.

FIRE PREVENTION

The common causes of fire are heating and cooking appliances, careless smoking, defective flues, careless use of electricity, and unsafe disposal of ashes. Cigarettes and matches left burning and forgotten, electrical appliances left switched on, or the joint left cooking to a burnt offering when some other urgent task turns up are all prolific causes of fire.

Investigators estimate that because of the fantastically large number of cigarettes smoked, if only 1 in 2,000,000 causes a fire, this will still be a dangerous proportion, possibly 10 per cent of all fires. People who must have a last cigarette in bed before going to sleep are inviting disaster. If the habit is deeply ingrained, at least the smoker should dispose of the cigarette as soon as he feels drowsy.

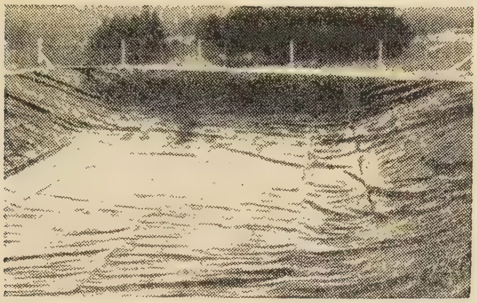
Kerosene or petrol should never be stored in the home. Both are potentially an explosive, even in small quantities. They should be stored in a detached building and lamps, heaters, and such appliances should be taken there for refilling.

All this emphasises that care is an important factor in avoiding fire loss.

Chimneys

Defects and cracks develop in chimneys from earthquakes, excessive heat, and other causes. These can be very dangerous when close to timber. Soot marks on the outside of a flue are a sign of such defects and must be investigated. When cracks are

Water WHERE and WHEN you want it



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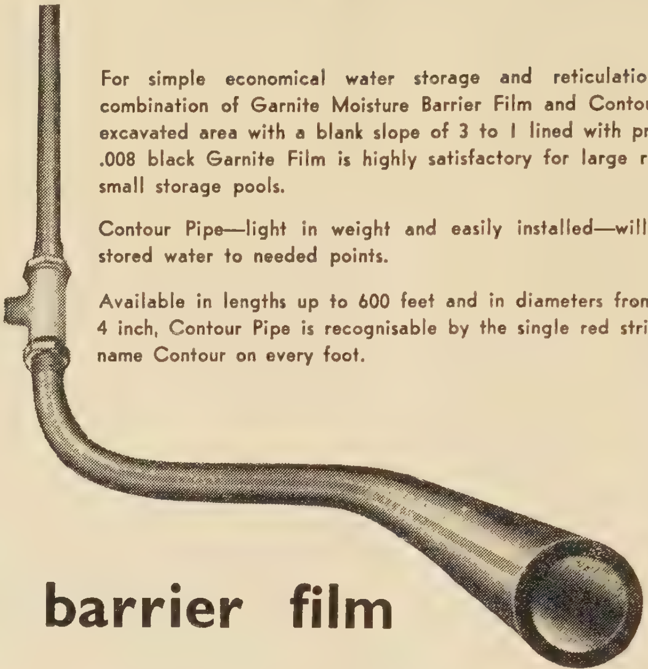

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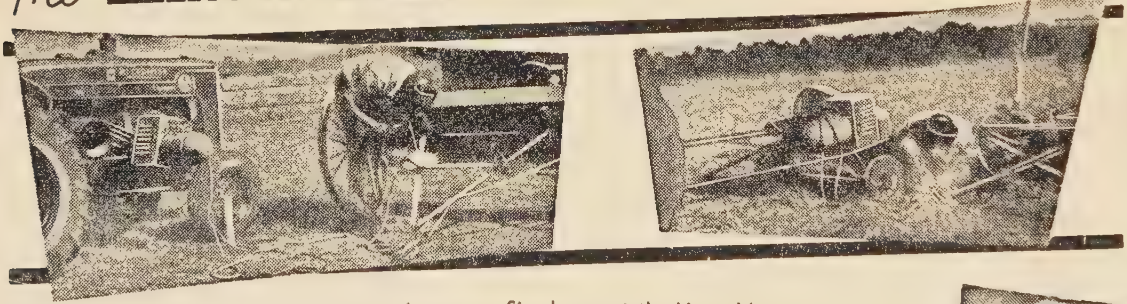

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found a skilled masonry worker should be employed to repair them.

The new slow-combustion and similar stoves require special consideration because of high temperatures reached in the flues. A clearance of at least 4 in. between the sleeve of the flue and any timber is necessary. There are many other aspects of safe flue installation, too numerous to describe in detail, but the prudent property owner should install such a stove with due regard to the very high potential danger from this source. The New Zealand Standards Institute has issued a booklet, "Installations of Domestic Space-heating Stoves", which describes in detail the best methods.

Regular sweeping of chimneys (at least annually) is recommended. Chimney fires are not of themselves dangerous, but flying embers may ignite other buildings and red-hot soot particles may cause ignition inside the home. The additional heat from the flue may ignite timbers, particularly through cracks or defective brickwork.

Such fires are best dealt with by extinguishing the burning fuel in the fireplace or stove and leaving the soot to burn itself out. Applications of small quantities of water will hasten extinction, but too much may cause cracks in flue liners. Burning is not recommended as a method of cleaning chimneys, as a hard carbon deposit is left on the interior of the chimney.

Most fire tragedies arise from ignition of clothing or asphyxiation of people asleep or escaping from bed. Guards on heating devices are important, particularly to protect children or the very old. Some clothing materials are dangerously inflammable. A guide to the hazards of commonly used materials is:

Highly inflammable: Cotton, organdie, muslin, tulle, flannelette, acetate taffeta, and rayon.

Less inflammable: Pure silk, wool mixtures, and nylon. Though nylon is not itself inflammable, it may when heated disintegrate and cling to the skin.

Discovery of fire in the middle of the night is a terrifying experience, particularly when children and elderly or invalid persons are involved. No preconceived plan can possibly deal with all the circumstances that may arise. However, if children are old enough, they can be taught to leave by bedroom windows and assemble outside if fire is suspected. Rescue and search operations in smoke and heat are hazardous.

Accumulation of combustible rubbish under floors or roofs should be avoided. In such locations fire can develop to a dangerous stage before discovery. Fire fighting in concealed spaces of this nature is dangerous for the inexperienced, and the only alternative is to remove the risk of fire starting there.

Equipment

Despite all the precautions that may be taken to prevent fire, outbreaks occur and every householder or farmer in remote areas should have some fire-fighting equipment. As most people do not experience a fire in their lifetime, there are limits to the amount of expenditure that is justifiable. Some may regard likelihood of fire as remote and no expenditure warranted; others may prefer to take precautions excessive to the apparent degree of risk. The intention of this article is to show the middle course and to assist the selection of appropriate equipment.

FIRE FIGHTING

All fires have different characteristics and no extinguisher yet produced will meet every contingency. To assist in a better understanding of the problem this classification of fires is used:

A class: Ordinary combustibles, such as timber and paper.

B class: Inflammable liquids, such as petrol, oil, and paint.

C class: Electrical.

For A class fires extinguishers using water are appropriate. Recommended types are bucket pumps, CO_2 water, or if a pressure water supply is available, hose reels. The last require a minimum operating pressure of 30 lb. per square inch.

For B and C class fires: Appropriate extinguishers are dry powder (20 lb. size) or CO_2 (9 lb. size).

There is other equipment with somewhat similar extinguisher characteristics, but the above recommendations are made with a view to all-round efficiency and simplified maintenance. With the exception of one type all the units mentioned can be recharged on the spot in much the same way as a soda syphon. With the above information the farm property owner should be in a position to state his fire problem more clearly when purchasing fire-fighting equipment.

There are about six major firms in New Zealand dealing in fire equipment and most of them have agents in the smaller towns. They should be in a position to supply suitable extinguishers with full details of their operating characteristics and some guarantee of a continued supply of recharges. At times equipment of little or no value has been offered by irresponsible salesmen, but well established fire-equipment firms can be relied on to supply appropriate equipment, with adequate arrangements for spare parts.

Fire equipment must be handy and ready for instant use. A few seconds' delay in attacking a fire can spell the difference between success and failure; once the attack with first-aid extinguishing equipment has failed total destruction of the property is almost certain. There is merit in arranging a practical demonstration for all members of the family and showing the recharging method.

Water for Fire Fighting

Adequate water at suitable pressure is essential to deal with fire involving buildings. Fire brigades require jets using up to 200 gallons per minute for house fires, but much smaller flows are effective. Pressure tanks or some farm pumping equipment capable of giving 5 to 10 gallons per minute at 30 lb. per square inch can be very valuable. Ordinary garden hose or hose up to 1½ in. diameter may be used, depending on the capacity of pumping equipment and extent of property to be protected.

The 1949 Fire Services Act provides for fire brigades to give as wide a coverage as possible and this service will be available to some farms. Where this service is practicable prior consultation with the brigade authorities is recommended. But brigades are helpless without water and farmers who can be reached by brigades should endeavour to provide satisfactory sources of water, such as dammed creeks or water holes. The construction of plastic-lined water storage tanks was described in the August 1958 issue of the "Journal" (page 97).

This article has dealt only with the basic aspects of fire protection. If the extent of any property or the fire problems associated with it justify special precautions, automatic protection can be supplied.

Heat-detecting systems or even sprinkler systems may be justified for very large homes or valuable woolsheds. Where such equipment is installed substantial insurance premium rebates may be allowed, but all aspects of cost in relation to the value of the property to be protected should be examined carefully before a system is bought. As some equipment purporting to have automatic detection value but really having very limited application has been sold, prospective buyers should always obtain expert advice.

There have been many occasions where fire precautions on the lines indicated have prevented potential disasters.

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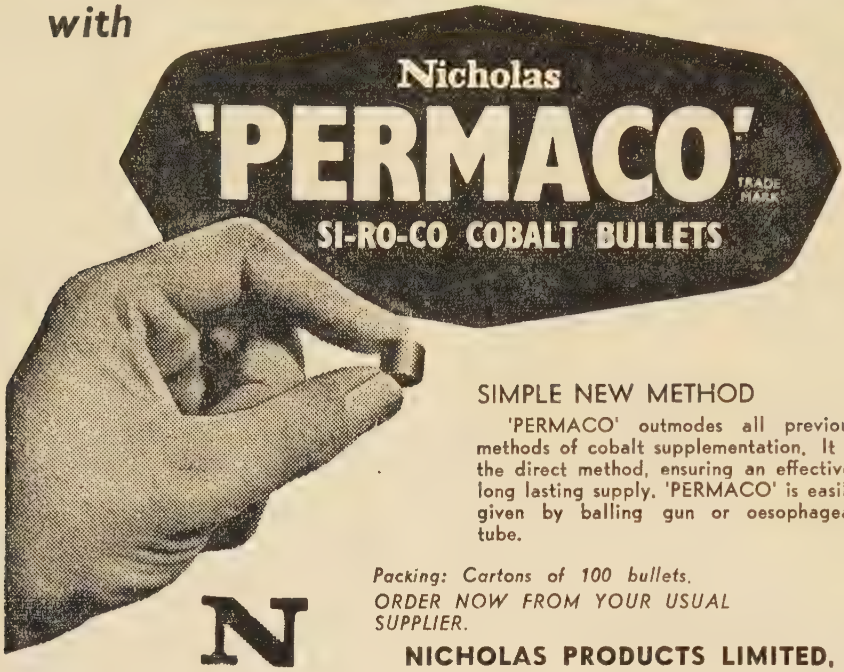

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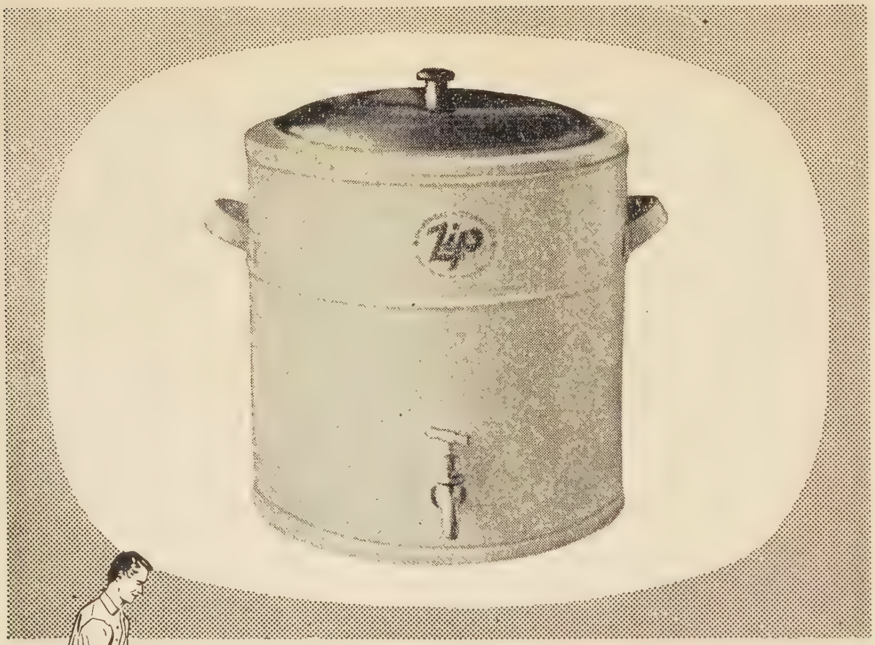

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Current Ideas on

Raising the Lambing Percentage of Sheep

THE production of a lamb is the end result of a chain of events or processes within the ewe. Lambing percentage is a measure on a flock basis of how efficiently the links in this chain of events have been functioning. Some of the factors under the farmer's control which increase the efficiency of the fertility chain, and thus affect lambing percentage, are discussed in this paper by I. J. Inkster, Research Officer, Department of Agriculture's Animal Research Station, Ruakura, which he gave at the 1958 Farmers' Conference Week.

FOUR topics, each of which can have a large effect on lambing percentage were dealt with. They were:

(a) The rearing of ewe hoggets

(b) The selection of the animals to be mated

(c) The management of the flock before mating

(d) The management of the flock during mating

The picture must obviously be incomplete, firstly because my story finishes at the end of tupping, and there is many a slip between then and lambing, and, secondly, because I am dealing only with the phases on which Ruakura has factual information.

Rearing of Ewe Hoggets

It is not always realised that hoggets which are well reared during winter not only have a lower death-rate than poorly reared ones but they also have a higher lambing percentage as 2-tooths. Hogget rearing studies at the Hill Station have shown that well reared hoggets (that is, ones which at the end of winter weigh about 15 lb. more than their poorly reared mates) not only produce more wool, but also have a lambing percentage 12 to 15 per cent higher as 2-tooths than poorly reared hoggets. The point I am trying to emphasise here is that attempts to raise the lambing percentage in a flock must begin with the raising of the replacements.

Selection of the Animals to be Mated

Farmers can affect the lambing percentage of their flock at this stage in two ways. In the short term they can endeavour to select the most fertile 2-tooths for inclusion in the flock, and they can cull the unproductive mature ewes. In the long-term they can select rams which from their breeding may be expected to increase the fertility of the next generation of ewes which they sire.

What information have we to help with the selection of the most fertile ewes? The selection of 2-tooths which were born as twins and the culling of ewes which have been dry for one or more seasons are methods that have been studied at Ruakura and discussed in other articles. Some information we have collected on the usefulness of certain physical characteristics as indicators of fertility in 2-tooth ewes is now presented.

How much attention should be paid to size in a 2-tooth ewe? Ruakura figures indicate that **within a line** of 2-tooths heavier sheep are not significantly more fertile than lighter ones, with the exception, of course, of real tail-enders. This means that when culling your own 2-tooths you are unlikely to improve your lambing percentage by throwing out your smaller sheep. When **different lines** of 2-tooths are under consideration at the saleyard, however, it is clear from the results of hogget rearing studies at the Hill Station that well grown lines are likely to be more fertile than poorly grown ones.

Farmers often ask whether it is possible to predict the fertility of 2-tooth ewes from the examination of their reproductive organs. Since a few farmers are already using some such method of selection, I should like to present the information we have been able to collect on the effectiveness of such systems.

Genital examination of ewes does permit the elimination of a very small number of sheep which will never have lambs. These consist of wethers (to the embarrassment of the farmer), hermaphrodites, and in addition, an occasional ewe which has a blind vagina. In this condition, due to an accident in development, a tough membrane occurs just in front of the site where the urine is discharged. In

PROFIT FROM IRRIGATION

An article, featuring this headline, appeared in the September issue of the "Journal of Agriculture". Outlining the experiences of a dairy farmer using modern irrigation methods in the Tauranga district, it gave positive proof of how he has been able to step up production, increase his income, and improve the value of his farm.

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some ewes a hymen or maiden membrane occurs in the same position, but this does not seem to prevent either conception or normal delivery of the lamb.

Another condition which may be quite common in 2-tooth ewes is that about 2 to 2½ in. from the exterior the vagina narrows to a funnel-shaped constriction which in an extreme case may have only a pin-hole circumference. This constriction is so tough that it cannot be dilated manually, and in a severe case it would seem that rams would either be unable to serve such a ewe or else would experience such difficulty that they would leave her in search of ewes which were more accommodating.

Mr D. McFarlane, of the Gisborne Veterinary Club, suggested that this constriction might be a cause of infertility in 2-tooths and he has conducted a wide survey in the Gisborne area. The theory has also been tested at Ruakura over the past three seasons. All 2-tooths are examined at tupping time and their vaginas classified as open, slightly constricted, constricted, and tight. The percentage of ewes lambing in each vagina class is shown in Table 1.

On the face of it, these figures show that the ewes with constricted vaginas are poorer bets for fertility than those without constrictions. However, these figures were obtained from 2-tooths in six different flocks, and the results were not the same in all flocks; that is, in some flocks the ewes in the tight class lambed better than those in the open class. The second point is that the difference between vagina classes was not of the same order in different seasons.

These figures agree with those obtained by Mr McFarlane in Gisborne over a much wider range of flocks. My conclusion from this investigation is that the classifications used at the moment do not achieve sufficient accuracy in detecting poor breeders to warrant the use of the system for culling 2-tooth ewes. Perhaps more experience will enable us to refine the system.

One more aspect of ewe selection remains to be considered—the well proven relationship between face cover and ewe fertility. This probably has its greatest significance, however, in the selection of rams. A considerable body of data has been collected on this subject, and the findings are briefly summarised here.

In all the flocks we have studied, when ewes are classified according to the amount of wool growing on their faces, it has been found that the open faced ewes wean more lambs than the covered faced ewes.

The difference in overall fertility between the two classes is achieved in different ways under different conditions. On hard hill country, where lambing percentages are low, the open faced 2-tooths are more fertile than the covered faced ones. On easier hill country 2-tooths are more fertile and the mature ewes have more twins in the open faced class than in the covered faced class. In the Romney ewes on Ruakura, where lambing percentages are high, face cover seems to show its main effects on the incidence of twinning.

The fertility flocks developed by Dr L. R. Wallace at Ruakura are particularly interesting for demonstrating the relationship. As a result of selection for and against twinning the fertility flocks are now three separate strains. Table 2 shows the effects of the selection on the distribution of face cover classes in the flocks.

TABLE 2—NUMBER OF EWES IN EACH FACE COVER CLASS

(Fertility Flocks 1957)

	Very covered	Covered	Slightly covered	Open
Low ..	33	62	21	11
Control ..	28	61	25	16
High ..	23	49	37	20

No selection has been practised in the Control flock, but in the High and Low flocks it has been respectively for and against fertility. Notice that this selection has also brought about a change in the face cover grades. The High flock contains a higher proportion of open faced ewes than the Low flock and a lower proportion of covered faced ewes. The unselected Control flock is intermediate.

Table 3 shows the incidence of twinning in ewes with different degrees of face cover.

TABLE 3—INCIDENCE OF MULTIPLE BIRTHS, PERCENTAGE OF EWES MATED

(Fertility Flocks 1955-57)

	Very covered	Covered	Slightly covered	Open
Low ..	8.6	11.2	11.9	15.8
Control ..	10.5	10.4	16.9	18.2
High ..	19.0	30.6	32.2	33.3
All flocks	11.6	16.5	23.0	25.2

Notice how in each flock, as we proceed from the very covered to the open-faced grades, the incidence of twinning increases. The most important point, however, is that in the most open faced grade of the low fertility flock the incidence of twinning is not as high as in the most covered faced group of the high fertility flock. The table shows that it is **within** a particular fertility strain of sheep that the open faced are the most fertile. In practical terms this means that when purchasing rams farmers should not only select open faced animals; they should also ensure that they are not choosing them from a strain that is of inherently lower fertility than their own flock.

TABLE I

	Vagina classification			
	Open	Slightly constricted	Constricted	Tight
Percentage of ewes in class	33.0	29.7	21.8	15.4
Percentage of ewes lambing ..	72.6	66.8	61.7	58.1

Management before Mating

There can be no more lambs born than there are eggs shed. The flushing studies conducted at Ruakura by Dr Wallace have clearly indicated that if the level of feeding is raised so that ewes are gaining weight for 3 weeks before they are mated, there will be an increase in the number of eggs that are shed and a resulting increase in lambing percentage. It also seems probable that the condition of ewes at the beginning of tupping is also important and this is to be investigated thoroughly next season.

With uncertain feed supplies and the periodic necessity for facial eczema precautions, the management of ewes before mating must often depart from the ideal. Nevertheless, it is the period which sets the maximum lambing percentage of the flock; all subsequent management is aimed at harvesting, as lambs, the greatest proportion of the eggs shed by the ewes in response to their pre-mating treatment.

Management during Mating

Experimental work conducted at this Station has shown that the lambing percentage of 2-tooth ewes can be markedly affected by the way in which they are managed during the tupping season. Two-tooths do not remain on heat as long as mature ewes and they do not accept service from the ram as readily. Evidence recently obtained indicates that the majority of mature ewes actually seek out the ram during heat, in contrast to a much smaller proportion of 2-tooths. As a result of these experiments it is evident that during tupping 2-tooths should be managed in such a way that they are virtually thrown into the arms of the rams, by running them in small paddocks and by regularly mustering them together during the mating season.

Conclusion

This article has dealt only with methods of improving the lambing percentage within a breed and the rich possibilities of crossbreeding have not been considered. Nor have the potential benefits of hormone treatment and other technical procedures been discussed. It has been possible only to enumerate and evaluate the various practical measures which can be used in the industry at present.

POTASH AND SPRING APPLICATION OF NITROGEN ON IRRIGATED PASTURES

AT the Department of Agriculture's Winchmore Irrigation Research Station some marked depressions in growth of irrigated pasture have occurred during many mid-spring periods and it was thought that soil moisture levels and temperatures were not always the limiting factors. However, low soil temperatures may be responsible for a restriction in nitrification and symbiotic nitrogen fixation and sufficient nitrogen may not be made available for the best production of grasses. Nitrogen may thus be the limiting factor, but if the nitrogen status is rectified, grasses may compete too strongly for other nutrients, potash in particular, and a restriction in clover growth could result.

To investigate these possibilities a trial was conducted at Winchmore (1) to test whether spring depressions in the growth of grasses could be eliminated by applications of nitrogen, and (2) to find the effects of potash on the seasonal production and grass-clover ratio of a mixed pasture receiving various applications of nitrogen.

The trial was carried out on a border-diked sheep pasture. The dominant species were perennial ryegrass and white clover, with cocksfoot as the sub-dominant species. The soil (Lismore stony silt loam) is shallow, flat, well drained, and mainly alluvial and aeolian.

All plots were well supplied with superphosphate and lime and were irrigated whenever half of the available soil moisture was used up.

Five rates (0, ¾, 1½, 3, and 4½ cwt. per acre) of ammonium nitrate-lime mixture (20 per cent nitrogen) were applied on potash (muriate of potash) at 2 cwt. per acre and non-potash plots. The heaviest rate was applied in 6 dressings of ¾ cwt. per acre at fortnightly intervals from 10 September to 25 November 1957. The other rates were applied on 8 October, when the pasture appeared to be nitrogen deficient compared with the plots already treated.

The trial was mown at fortnightly intervals to determine short-term differences in dry matter production, grass-clover ratios, and total nitrogen content of grasses and clovers.

RESULTS* A significant response in dry matter yield to potash was recorded only during spring on non-nitrogen plots. The grass-clover ratio and total nitrogen percentage of grasses were only slightly affected by potash.

Nitrogen, at all rates, gave immediate responses in colour, vigour, and total nitrogen percentage of grasses.

The seasonal effects of ammonium nitrate-lime mixture and potash on pasture production are shown in the following table:

RELATIVE DRY MATTER PRODUCTION (CONTROL = 100)

Treatments	Spring	Summer	Year 9/8/57-31/5/58
No muriate of potash			
1. No N	100	100	100
2. ¾ cwt. N	108	98	102
3. 1½ cwt. N	117	96	105
4. 3 cwt. N	121	93	105
5. 6 dressings of ¾ cwt. N	130	92	107
2 cwt. muriate of potash per acre			
6. No N	111	100	101
7. ¾ cwt. N	113	94	102
8. 1½ cwt. N	119	93	101
9. 3 cwt. N	125	90	101
10. 6 dressings of ¾ cwt. N	132	83	101

N = Ammonium nitrate-lime mixture (rates per acre)

Significant nitrogen responses in grass growth were recorded during the whole spring period. The best responses occurred in mid spring, when a depression in pasture production was largely eliminated. It appeared that the gain in production of grasses was the result not only of the growth of individual tillers but also of an increase in the number of tillers of ryegrass.

White clover showed only a short-term effect in colour and a small response in total nitrogen percentage. However, the average total nitrogen percentage for the period from 8 October to 21 November was not affected—5.8 per cent for all treatments. The development of new stolons was retarded on nitrogen plots. The depression in clover growth was proportional to rates of application and accentuated by potash.

The effects of nitrogen on the grass-clover ratio and on the total nitrogen content of the grasses is shown in the following table:

Ammonium nitrate-lime mixture cwt. per acre	Period	Grass-clover ratio (average)	Per cent total nitrogen in grasses (average)
Nil	8/10/57-20/12/57	1.0 : 1	3.5
3		2.3 : 1	4.0
Nil	20/12/57-6/3/58	1.5 : 1	4.2
3		2.1 : 1	3.9

Even after the nitrogen response in grass growth had disappeared clover growth was still relatively poor and only during the second half of February and March did the differences in clover growth cease.

COMMENTS 1. Potash gave an 11 per cent response in pasture growth during spring in the absence of nitrogen.

2. Nitrogen gave a marked and significant response in pasture growth in mid spring followed by a smaller, but still significant, depression in summer. Grass-clover ratios were much increased.

3. Total nitrogen levels of clovers were hardly affected by applications of potash and nitrogen.

4. Total nitrogen percentages of the grass component of pasture which was topdressed with nitrogen in spring were increased during spring and early summer, but reduced during late summer.

5. The total nitrogen content of the mixed pasture was greatly decreased in late summer as a result of heavy nitrogen applications in spring.

—*J. LAMMERINK, Winchmore Irrigation Research Station*

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* The results given above refer to one season and one location. They cannot be applied to other seasons and locations without further work.

The Home Garden in February

By A. G. KENNELLY,

Horticultural Instructor, Department of Agriculture, Dunedin

THOUGH there is some variation according to district and situation, there are generally only four good growing months after Christmas and with the disruption in garden work so often caused by the Christmas and New Year holidays many gardens are neglected during the greater part of January and important garden work is left until February. This loss of one of the best growing months may seriously reduce the period for good growth in southern districts, particularly of winter greens, including leeks, savoy cabbage, broccoli, and silver beet.

WINTER greens should be regarded by home gardeners as among the most important crops in the garden. With forethought they can be grown so that produce can be harvested from them from late autumn until late spring, when vegetables are most likely to be scarce and dear.

As it is late in southern districts and the less favourably situated gardens elsewhere for the setting out of winter greens, they should be planted without delay if this work has not yet been done. Success apart from weather will depend largely on soil fertility and the use of healthy, well grown plants.

The aim of the efficient gardener should be continuity of supply within the limits set by the size of the garden. This calls for special emphasis on having crops in bearing when vegetables are usually scarce and dear, together with the maintenance of good soil texture, consistently heavy yields of quality produce, tidiness, and freedom from pests and disease.

Soil Improvement

As harvesting progresses land becoming vacant and not required for vegetables should be forked over and sown with a cover or green manure crop. Green manuring is not strictly a substitute for animal manure, as except where legumes are sown, it does not add materially to the stores of plant food in the soil. It consists of growing a crop to prevent erosion and leaching of plant food and to increase the organic matter in the soil.

The crop grown should be vigorous and grow rapidly, but even a crop of

Sowing and Planting

Sowing Suggestions

Cabbages for spring use (except in mild northern districts), Chinese cabbage, kohl rabi, lettuces, mustard greens, peas, radishes, swede turnips, spring onions, silver beet, spinach, turnips. (In most districts crops are likely to develop most satisfactorily if seed is sown early in the month.)

Plants to Set out

In southern districts or where soil or situation are not favourable for good growth the following are best set out at the beginning of the month:

Savoy or winter cabbage and broccoli (different varieties to give a succession, if necessary to provide heads until early spring), Brussels sprouts, borecole or kale, Chinese cabbage, celery, kohl rabi, leeks, lettuce. In mild northern districts: summer cabbage, cauliflower.

[Green and Hahn

The sowing of green manure or cover crops should always be part of the routine in home gardens. This plot not required for immediate planting with vegetables has been sown with barley.

weeds, provided they are not allowed to flower and are not of a twitchy habit, may often be put to good use. Chickweed, fat-hen, spurrey, and redshank can be used, but couch, docks, sorrel, and yarrow are unsuitable, as any increase in humus would be offset by an increase in weed growth.

Leguminous crops, such as peas, vetches, and lupins, are excellent, as they fix nitrogen from the atmosphere in the nodules on their roots. Dug into the soil, the roots, stems, and leaves contribute a valuable supply of combined nitrogen and organic matter. The nitrogen is slowly liberated by bacterial action and ultimately is taken up by the plants as nitrate.

The large quantity of organic matter supplied by digging in a heavy green crop greatly improves the physical properties of the soil. Though non-leguminous green manure crops have not the power possessed by legumes of increasing the amount of nitrogen in soils, their growth prevents losses of nitrates and other important nutrients which they take up and which might otherwise be lost through leaching. Non-legumes suitable for green crops include mustard, barley, oats, ryecorn, and rape.

Green manure crops draw heavily on the soil water content, and when a vegetable crop is to be sown or planted in late summer or early autumn immediately after a green crop the soil moisture may have been reduced excessively by the green crop. However, this effect is unlikely to occur with green crops sown in February.

Vegetable matter to be dug in, if abundant, should not be allowed to become excessively woody. Usually it should be dug in in the flowering stage. The conversion of plant tissues and other organic matter to a form which may be assimilated by the plant is carried out by bacteria and fungi, of which there are many species in the soil.

Specialised groups each perform a definite function. Most are saprophytic, that is, they live on dead organic matter such as animal or plant parts or residues which may be dug into the soil. Provided there is enough moisture, they multiply enormously in the presence of food, but when the food supply is depleted most of them disappear, for the microbial and fungal populations of the soil fluctuate considerably.

Bacteria and also fungi break down nitrogenous substances to ammonia, on which plants feed; specialised bacteria work on the excess ammonia, and the nitrate which is then available is usually considered to be the most easily assimilated form of nitrogen. Thus fungi and a series of different bacteria work in a linked progression to produce food in an assimilable form for the plant from the most diverse and often unexpected material.

Importance of Organic Matter

The importance of continually adding organic matter to the soil is realised by all successful gardeners. The state of greenness or succulence of a material is very important. When straw or other material deficient in nitrogen is added to the soil it is advisable to add sulphate of ammonia (or a similar nitrogenous fertiliser) at at least 6 lb. per hundredweight of strawy matter to speed rotting so that temporary nitrogen starvation is avoided and the organic material is converted more speedily to plant food or humus which is homogeneous with the soil. Some lime is also needed to reduce acidity.

Owing to the need for continuous and usually intensive cropping in most home gardens soils tend to lose organic matter more quickly than it can normally be replaced. It is therefore most important to dig in all available organic material. Any rubbish which is free from insect pests and diseases should be returned to the soil either via the compost heap or dug directly in. The urban home gardener is unlikely ever to be in the happy position of having available more organic material than his garden requires.

Asparagus

Top growth of asparagus is now well developed and in exposed gardens may need support. Stout string tied to stakes driven into the ground at 5 to 6 ft. intervals is usually satisfactory. Weed control is not difficult if the weather is dry, as most weeds are smothered by strong fern growth. Where weeds are troublesome they should be removed by hand to prevent seeding. Beds should not be neglected because cutting is finished. If dry, they should be watered and, though February application is rather late, fertiliser can be supplied with advantage if none was given after cutting ceased.

Considerable research into the manuring of asparagus has been done and generally research workers agree that a complete fertiliser (one containing nitrogen, phosphoric acid, and potash) should be supplied. However, there is some difference of opinion as to the best time to apply it. Advocates of early spring application usually favour in addition a dressing of quick-acting fertiliser such as nitrate of soda or sulphate of ammonia at 1 to 2 oz. per square yard after cutting ceases. On most beds the time of application of a complete fertiliser seems to make little difference to production. If applied just before cutting, the fertiliser can have little effect on the current crop; the important point is that a balanced fertiliser should be available to the plant to enable it to build up food reserves from which good spears can be produced.

Carrots

Carrots are not difficult to grow if the soil is fertile, cultivated to a fine tilth, moist, and well drained and the plants are kept free from insect pests. Light, sandy loams produce the smoothest and straightest carrots, but all good loams apart from the heavier clay loams can be improved to produce satisfactory crops.

A late sowing of one of the quicker-maturing varieties of carrots can be made in warmer districts in February. If success is to be obtained in southern and most central districts of New Zealand, the situation and autumn weather must be favourable and the seed sown without delay in soil that is in good condition and worked to a fine tilth.

Difficulty in growing carrots is commonest in the smaller garden, where cropping is usually continuous and good crop rotation with adequate green cropping is difficult, and in soils that have been worked for many years without having had much organic matter, such as compost, heavy green crops, or farmyard manure, added to them.

Soils that were heavily dressed with organic manure for the previous crop usually produce good carrots. Heavy dressings of organic manure just before sowing are not advised, though results may be satisfactory if the manure is well rotted and mixed throughout the root area. Carrots coming into contact with lumpy masses of fresh or only partly rotted manure may be forked or otherwise distorted.

Fertiliser

Results are likely to be better on most soils if mineral fertiliser is used to supplement the organic manure in the soil. A complete fertiliser, that is, one made up to contain major amounts of the elements nitrogen, phosphorus, and potassium, is likely to give the best results over the greatest range of soils, but good responses have been obtained on many fertile New Zealand soils from superphosphate alone.

Seed should be sown ½ in. deep in rows 12 to 15 in. apart at about 15 to 20 seeds to each running foot of row. On soils that form a crust after rain the crust should be broken to facilitate emergence of the tiny shoots.

Aphids can be controlled by spraying on a warm, still day with nicotine sulphate at 1½ teaspoons (approximately) to 1 gallon of water plus a little soap or lime to activiate the nicotine or with lindane used at the same strength without soap or lime. Two good varieties for the home

[Green and Hahn

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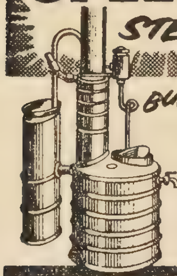

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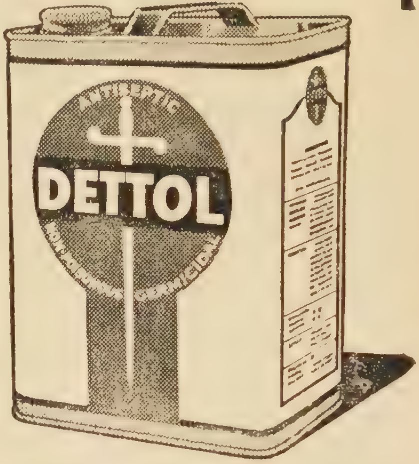

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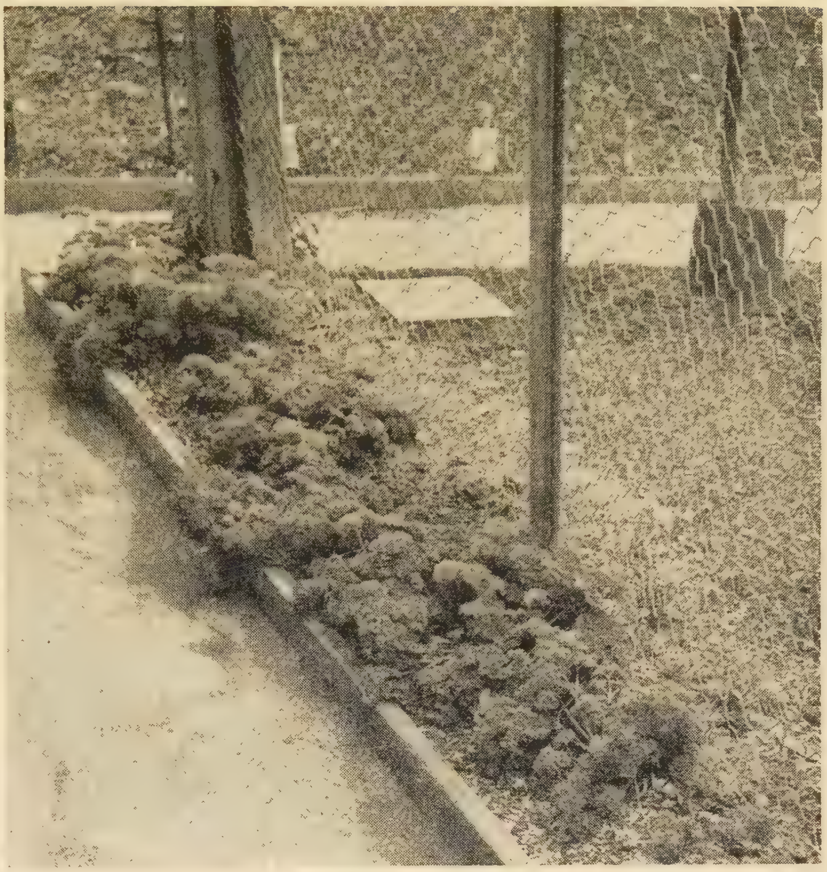

[Sparrow

To ensure adequate supplies of parsley it is necessary in most gardens to sow it twice a year. February is a good time to make one sowing.

garden are Red Cored Chantenay and Taranaki Strong Top.

Celery

In districts where good growing temperatures can be expected for the next 2 months celery can still be set out. Where autumn or early winter weather is not too boisterous or frosts too severe a variety such as Golden Self-blanching can be planted. Elsewhere one of the hardier non-self-blanching varieties such as Solid White is preferable.

Celery plants should receive plenty of water; liquid manure is especially valuable where plant food and water tend to be deficient. Plants must be kept growing vigorously. Where leaf spot disease is troublesome sprays of copper oxychloride or other suitable Government-certified fungicide should be applied regularly.

Chinese Cabbage

Chinese cabbage is somewhat like cos or romaine lettuce, but the size of its oval, elongated head is usually nearer that of Swiss chard. It is sometimes called lettuce-cabbage, as the texture of its leaves is more like that of lettuce than that of an ordinary cabbage.

Chinese cabbage is tender and quick growing, the commoner varieties maturing in good conditions in about 70 to 90 days. It should be treated like lettuce as far as growing conditions are concerned, but as it grows much bigger, it needs wider spacing. The plant is also known as celery-cabbage because of its flavour and because some of the forms resemble celery somewhat.

Chinese cabbage can be sown in spring also, as it usually does well in the cool conditions then prevailing. Seed can be sown in good soil in a sheltered situation or in boxes under glass 3 to 4 weeks before plants are required for setting out. Spring or autumn sowing is best in most districts, because if it is sown in summer and the weather is hot and dry, growth is slow and consequently the plants often fail to head properly, developing seed stalks instead.

Chinese cabbage stores quite well after cutting and may be eaten either cooked or raw. The inside blanched leaves and heavy but tender midribs have a delicate celery-lettuce flavour.

Seed is best sown ½ in. deep in rows 18 in. apart in a moist, well drained soil that is very rich in humus. When the seedlings are 3 to 4 in. high they should be thinned or transplanted 12 in. apart in the rows.

Varieties include Wong Bok (Pao Ting), which is a short, quick-growing variety 9 to 11 in. high and up to 6 in. in diameter. Pe Tsai is a taller and thinner variety than Wong Bok with looser leaves. It stands dry conditions slightly better, but its flavour is not usually considered as good as that of the others. Chihli is a tall early variety 15 to 20 in. high with a base diameter of about 3½ in.

Onion Harvesting

Readiness of onions for harvesting is indicated by drooping of the tops just above the bulbs while the leaves are still green. Gradual dying back from the tops of the leaves while the necks remain rigid, erect, and thick is an indication of abnormal ripening and usually of poor keeping quality. Insect pests or heredity may be responsible. There is likely to be a percentage of this type in practically all crops.

The roots of healthy, well grown onions ready or nearly ready for harvesting lose their hold on the ground as they gradually die and the necks soften. This results from transference of the soluble solids of the leaves into the bulbs until the outer succulent layers of the bulb nearly close the opening on the inner scales. After the necks shrivel the leaves gradually turn yellow and dry off, even if the onion is not harvested.

If the onion bulbs dry off prematurely, the necks of the bulbs may remain open and allow various organisms which cause rots to enter. Premature drying off of the bulbs may be due to injury by heavy infestations of thrips or by damage to the roots by hoeing, though growers sometimes hoe off the roots to cause premature death of the leaves and thus speed the drying off of the crop so that harvesting can proceed.

Except in a few areas conditions in New Zealand are rarely ideal for harvesting onions and it may not be possible to wait until the crop reaches the best stage for harvesting. Early frost is a risk in some districts. Light frosts do not harm onions, but heavy frost may cause severe injury.

Onions with thick necks or that have not closed at the neck or bulbs left to dry that have been subjected to showers or to heavy dews are likely either to rot or take root again. Where conditions for drying are not likely to be suitable onions should be dried or cured under cover.

Drying or curing usually takes 3 to 4 weeks. In the lower-rainfall districts

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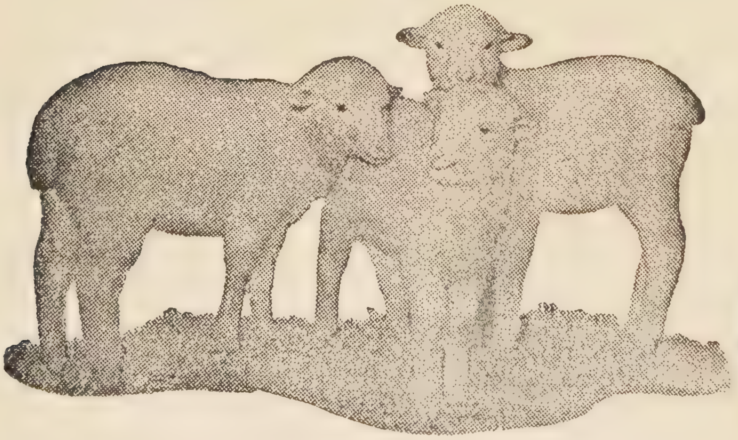

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where a spell of fine weather in autumn is likely bulbs can be left on the ground. The tops should be left on to give them some protection from the sun. If rain falls or there are heavy dews, they should be turned to enable them to dry evenly and to check rots, sprouting, or discolouration by the wet soil.

After drying it is usual, though not essential, to top onions by cutting or twisting the tops ¾ in. from the bulbs. Twisting is preferable, as it closes the top of the bulb and the twisted leaves act as a barrier to the entry of rot-producing organisms. Alternatively, the bulbs can simply be gathered when dry and packed in open-mesh bags or in shallow open boxes or strung.

Parsley

Parsley is usually in constant demand and to ensure adequate supplies seed should be sown twice a year in most gardens, in spring and in autumn. The plant is a biennial and unless conditions are especially favourable, germination is usually slow; if two sowings are not made, there may be a break in supply. Parsley responds well to rich, well drained soils and fertiliser is just as necessary as for other crops.

Seed can be sown in rows or broadcast on a small prepared plot, but for best results the plants should be spaced about 8 to 12 in. apart when at the seedling stage. They make quite a good edging and do well in a cool, moist soil in the open or semi-shade. Seed may be slow to germinate, but sometimes germinates quite promptly if it is first soaked or is sown in very moist soil.

If two sowings are made each year, there should be no need to dry or store parsley, though storing is quite a simple matter. The most desirable dried parsley is obtained by constantly picking a few of the best young leaves as they develop in summer and autumn; spring-dried parsley rarely keeps its colour. The leaves can be laid out in single layers and dried in heated rooms, though most housewives will find it more convenient and the final product better if the leaves are dried at a temperature of about 90 degrees F. in a fairly hot oven with the door open. Quick drying is imperative to retain the oils that give parsley its characteristic scent and to preserve its colour. When dry it should be rubbed or pulverised and coarse pieces of stalk should be removed. The leaves can then be put in bags and should be stored in a dry place. If allowed to reabsorb moisture, they tend to become rubbery.

Parsley is sometimes gritty with soil from rain splashes, but it should not be cleaned with boiling water. If it cannot be cleaned with a thorough shaking, it should be washed under a cold tap.

Because parsley is a biennial, it usually begins to send up seed stalks early in its second year. Little is to be gained, however, by picking them off, as the plant's energy becomes more and more concentrated on their production.

Greenfly is often troublesome on parsley, but is easily controlled by spraying with nicotine sulphate 1 : 800 (1½ teaspoons of nicotine sulphate to 1 gallon of water plus a little soap dissolved first in water) or lindane.

[Green and Hahn

Brussels sprouts are among the most useful winter vegetables and in most districts plants should be set out not later than the beginning of February.

Silver and Spinach Beet

Silver beet is also called Swiss chard or sea kale beet and good strains if well grown are particularly robust, with strong rooting systems and large succulent leaves. Spinach beet or perpetual spinach beet produces more numerous leaves that are not as large as those of silver beet but can usually be plucked from the plant over a longer period.

Silver beet and perpetual spinach beet are both excellent as stand-by crops, particularly in smaller home gardens, as in most conditions they bear for longer than any other greens. In addition, because of their vigour, they succeed in most soils and are not usually affected by root diseases.

Seed should be sown without delay in any but the most favourable districts to enable plants to make as much growth as possible before winter. Alternatively in the cooler districts plants should be set out. They are usually available from seedsmen. Seed should be sown ½ in. deep in rows 15 to 18 in. apart. Most of the listed varieties are good.

Spinach

Though spinach is usually one of the first subjects for early spring sowing, it is also a useful vegetable for autumn sowing where conditions are not too hot and dry. Under these conditions it can be sown in well cultivated fertile soil throughout autumn and early winter.

Spinach, generally rated highly as a health-giving vegetable, is quick growing, maturing under favourable conditions in from about 40 to 55 days. It will grow at temperatures only slightly above freezing, though the optimum growth temperature is somewhat higher. Though seed germinates at relatively low temperatures, seedling emergence is usually delayed where there is frequent heavy rain.

Spinach is usually classified according to whether the seed is round or prickly and most seedsmen still sell

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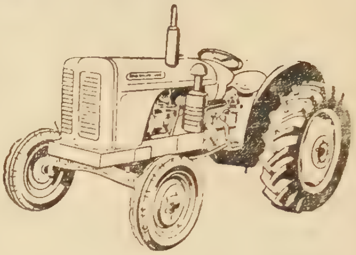

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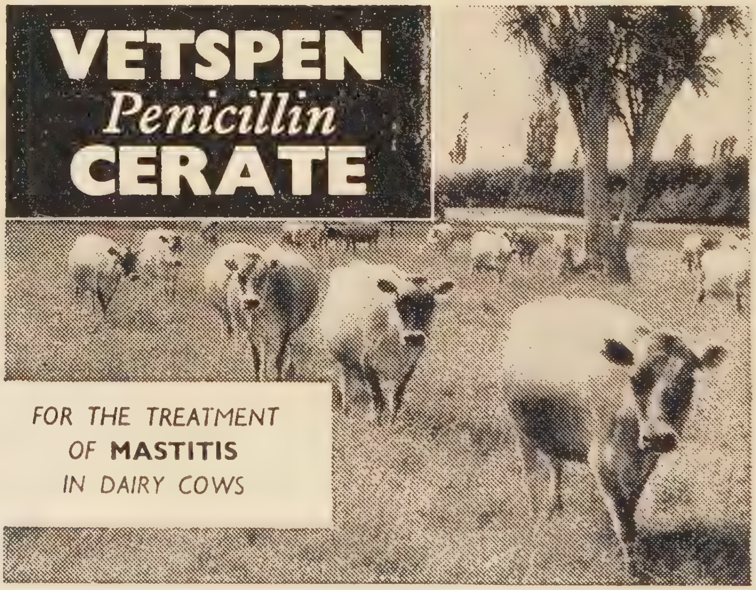

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spinach mainly as either prickly seeded or round seeded, though it is preferable to buy named varieties suited to specific purposes irrespective of seed type. Prickly-seeded spinach is usually sold for winter use as it is generally considered hardier and more long standing than round seeded. This belief in the superiority of prickly-seeded spinach is not supported by the evidence of trials of different varieties of the two kinds, as it has been clearly demonstrated that there are long- and short-standing varieties of both round-seeded and prickly-seeded spinach. Either may be smooth or savoy (crumpled) leafed.

The habit of bolting to seed, which is an inherent factor present to a greater or less degree in all varieties of spinach, is encouraged by long days and high temperatures. For this reason summer sowing of even the relatively long-standing varieties is not advisable in certain districts. Even the most heat-tolerant varieties will not germinate and grow well in hot, dry weather. When excessively high temperatures are maintained for some time the edges of the leaves, particularly of the older ones, turn yellow. Continuing high temperatures result in the whole leaf turning yellow and the plant is then likely to die of rot or collar disease.

Soil Conditions

Spinach thrives in cool conditions and in a great range of moist, rich, well cultivated, and well drained soils. It is not tolerant of high soil acidity and lime should be applied to most soils that have not been dressed recently, though too much may cause yellowing because of a deficiency or unbalance of certain essential elements such as manganese or iron.

A good dressing of organic material such as well rotted farmyard manure or compost supplemented by a complete fertiliser at 1½ to 3 oz. per square yard is advisable on many gardens. As spinach is a leafy vegetable, extra nitrogen may be supplied by liquid manure or a side dressing of nitrate of soda or sulphate of ammonia raked in along the line of row. Liquid manure is preferable where conditions are inclined to be dry, as abundant moisture is essential for high yields and good quality; growth should be reasonably quick, as otherwise some varieties tend to be tough.

Seed should be sown thinly ½ to 1 in. deep in rows 12 in. apart. Plants can be thinned to 4 to 5 in. apart in the row, though if seed is sown thinly, very little thinning may be necessary.

Disease

The virus disease mosaic sometimes causes reduction in yield. The first symptoms appear on the youngest leaves as numerous, fairly large, golden yellow flecks accompanied by crinkling. In a few days yellowing becomes general over the leaf. Older leaves wither at the tips, become yellow, and die. In a few weeks the plant is reduced to a small, stunted rosette of much-crinkled leaves. Infected plants should be removed and burnt.

Aphids are probably the most active agents in spreading mosaic, which may be carried over from one season to the next in plants of crops such as silver beet, spinach, and beetroot. Aphids should be controlled by regular spraying with nicotine sulphate or lindane.

Salad Crops

Salads are most in demand in hot weather, and if conditions are not too dry, there should be some salad vegetables available in most home gardens in February. Tomatoes and cucumbers are regarded as main crop vegetables and are ready for harvesting in most gardens, but successional sowings are necessary for radishes, spring onions, lettuces, mustard, and cress.

Chives are an excellent substitute for spring onions and should be grown in the garden of every household where the flavour of spring onions is appreciated. The leaves are used as a mild substitute for onions in flavouring salads, soups, and omelets. Chives are easy to grow and are not particular as to soil, though they do especially well in a good, well cultivated soil that suits onions. If the foliage is cut frequently, new tender leaves develop continuously. Plants should be lifted, divided, and replanted in fresh ground in spring or autumn every 3 or 4 years.

Radishes

Radishes are not easy to grow successfully in hot weather unless the soil is very fertile and there is adequate moisture. The roots should not be allowed to dry out and in February shelter from the sun is often advisable. Shade can be provided by sowing radishes beside a taller crop such as celery or sweet corn. The top 6 in. of soil for radishes should be finely cultivated and very rich in well rotted organic matter. Seed should be sown ¼ in. deep in rows that need be only about 4 to 6 in. apart. The soil should be gently firmed before sowing or the roots will not bulb properly.

Lettuces

Good lettuce is an essential component of most salads, but, like radishes, lettuces are not easy to grow well unless conditions are favourable. A constant and fairly high amount of soil moisture is needed from seeding to harvest, as wide fluctuations are liable to cause plants to run to seed prematurely or to be of poor quality; plants may not heart well and are then usually tough and bitter. The soil should never be very wet for long after rain or watering; it should drain quickly so that it is soon freely workable. On the other hand the moisture content of the soil should never become so low that more than the surface is dry. Such exacting conditions make lettuce production in hot, dry districts very difficult and the more adaptable varieties should be chosen where possible.

Varieties such as Imperial 847 and New York No. 12 will tolerate a wide range of conditions and can be grown for a long period in most districts. Strains such as Webbs Wonderful, Neapolitan, and Success, however, generally give good results. For those who are content with an open rather than a hearting type of lettuce the variety Bronze Beauty matures very quickly and has an excellent, rather nutty flavour. It is a vigorous grower and withstands hot conditions. The colour of the leaves is a ruddy bronze overlying a soft green.

Seed of lettuce should be sown thinly ¼ in. deep in rows 12 in. apart and the plants should later be thinned to 10 to 12 in. apart in the rows.

Spring Cabbage

Though in northern districts or in sheltered situations spring cabbage can be grown from seed sown in March, February is the preferred month for sowing. Where soil and situation are not good seed should be sown early in February. Seed of spring cabbage is not usually sown before the end of January, because if seedlings are set out too early, plants mature too quickly. If seed is sown early and plants are left in the seedbed until the usual setting out time, they may become too large to transplant well. If very large plants are set out where winter temperatures are low, they are very liable to run to seed.

Though cabbage is a cool climate vegetable, seed germinates and plants grow well in a fairly wide range of temperatures if the physical condition of the soil is good and it contains adequate moisture and plant nutrients.

Protective Sprays

Many home gardeners have difficulty in raising cabbage seedlings for setting out for the spring crop. The seed usually germinates quickly, but seedlings are often attacked by fungous diseases such as mildew and by insect pests such as aphids, caterpillars, or thrips. Regular spraying with copper oxychloride or nabam and a suitable insecticide will control most fungous diseases and any insect pests.

However, cabbage seedlings are difficult to spray, because the leaves have a smooth, almost greasy surface to which the spray does not cling well. In the early stages, too, leaves are rather delicate and easily depressed by the pressure of sprays.

Proprietary wetting agents, which are usually compounds similar to

(Continued at foot of page 54)

Correspondence Courses in Agriculture

CORRESPONDENCE courses in agricultural subjects are provided by the two correspondence schools of the Department of Education in Wellington for students in any part of New Zealand who cannot attend day or evening classes in their locality. These schools are the Correspondence School and the Technical Correspondence School.

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Correspondence School Courses

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A 1-year course dealing briefly with the more important branches of New Zealand's agriculture. This course is used as an introduction to the agricultural subjects of School Certificate, but it is also suitable for general study by pupils and adults interested in farming in New Zealand.

School Certificate Subjects

General agriculture. A 2-year course covering how a plant grows, seed certification; soils, fertilisers, and manures; crops and pastures; the main types of plant and animal life of interest to the farmer.

Animal husbandry. A 2-year course covering the cow, pig, horse, and sheep; principal breeds; current economic problems in stock farming; wool; pastures and their management; supplementary crops; genetics; physiology and diseases.

Dairying. A 2-year course covering milk, cream, butter, and cheese; their production and distribution; herd testing and improvement; care and management of cattle; use of dairy products.

Biology. A 2-year course covering the form and function of plants and animals in relation to their environments.

Horticulture. A 2-year course covering plant form, function, and growth in relation to gardening matters.

The School Certificate subjects may also be taken for general knowledge by non-examination pupils. Any number of the above courses can be studied at the same time and provision is made for both written and practical work.

Subjects for Junior Examination of National Diploma of Horticulture

Chemistry.
Bookkeeping.

Technical Correspondence School Courses

Agriculture

Dairy Farming

The course gives a knowledge of the breeding, rearing, and general management of dairy stock under the grassland system of farming practised in New Zealand.

Consideration is given to soil and fertilisers, pasture management, farm layout, shed construction, sharemilking, valuing and purchasing farms, pig husbandry, and farm engineering.

Sheep Farming

The course covers principles of breeding, growth and development, nutrition, pasture management, wool, wool types, factors affecting wool production, preparation of the wool clip, and farm engineering.

Arable Farming

The course deals with the general characteristics of arable farming, crops and cropping, stock policy, management of pastures and equipment, budgeting, and the yearly cycle of operations.

Horticulture

Courses for the Junior, Intermediate, and National Diploma Examinations of the Royal New Zealand Institute of Horticulture

Horticultural botany.
Principles of botanical classification.
Principles of plant protection.
Principles of horticulture.
Practice of horticulture.

Certificate in Vegetable Culture

Course for those engaged in market vegetable production.

Courses for Horticultural Apprentices

General horticulture.
Horticultural botany.

Dairy Manufacture

The purpose of the courses in dairy manufacture is to offer workers in the dairy industry theoretical instruction in butter and cheese manufacture and to provide the necessary tuition for those who wish to enter as candidates for the Dairy Factory Managers' Registration Board examination.

The courses give instruction in the following subjects:

Buttermaking.
Cheesemaking.

Dairy factory management.

Rural Valuation

Courses in the following subjects of the professional examination of the New Zealand Institute of Valuers are available.

Field husbandry.
Animal husbandry.
Surveying, levelling and building construction.
Rural valuation law.
Farm economics.

Short Courses

Short courses are available in the following subjects:

Arable farming.
Farm bookkeeping.
Crops and cropping.

Home Garden

(Continued from page 53)

detergents sold for household dish washing, aid the wetting of the leaves if added to the spray. If the spray is applied under pressure through a fine nozzle so that spray drifts as a mist, the under sides of most of the leaves should be covered with spray deposit.

Caterpillars and usually thrips are readily controlled by spraying with DDT. It can be used alone or added to the fungicidal spray. Thrips often check young plants and little is done about them because they are not seen unless the plant is examined closely. Thrips are minute, cigar-shaped creatures up to about ⅛ in. long. They are dark in the adult stage and have wings, with which they fly short distances if disturbed.

The immature stages are wingless, green or light yellow, and do not move readily. Thrips rasp the under surfaces of cabbage leaves and denude them of their green colouring matter and so reduce the leaf function.

Aphids, usually the cabbage aphid, which is greyish and rather mealy, may also attack cabbage plants. Among any group of grey aphids, particularly in dry conditions or toward the end of the season, a number are usually winged. Under dry conditions and in heavy infestations it is often possible, if the colony is observed closely, to see tiny wasps not much larger than the aphids which parasitise the aphids.

Aphids and thrips can be controlled by spraying with lindane.

Varieties

Flower of Spring, Enfield Market, and Triumph are among the best and most commonly grown varieties of spring cabbage, except in some northern parts of the North Island, where Jersey Wakefield and the summer cabbages Green Acre and Golden Acre are also favoured. Several other good varieties are listed in most catalogues. For the home gardener who has sufficient ground and is interested in improving his crop a trial of a new variety is well worth while. It may specially suit his conditions and even if it is not an improvement, it may mature at a different period and contribute to the continuity of his supply.

LEVIN HORTICULTURAL RESEARCH STATION

THE official opening in December of a new administrative and laboratory building for research and technical staff at the Department of Agriculture's Levin Horticultural Research Station was combined with a field day during which growers, nurserymen, and other visitors were able to inspect and inquire about the experimental and research work at the Station. Since the area of 33 acres was taken over by the Department in 1947, gradual development of the Station and lack of adequate buildings have restricted research activities mainly to berry fruits, but expansion of the work, particularly in vegetables, is now possible with the recent erection of two large aluminium framed glasshouses and adequate laboratory facilities.

HEADING ILLUSTRATION: Machinery demonstration during the field day. The new administration and laboratory building is in left background with staff housing to the right.

WITH 25 acres available for experimental work the Levin area is the principal horticultural research station of the Department. Research and experimental work is aimed at increasing the production per acre of horticultural crops and seeking methods to reduce production costs.

Suitability of District

Requirements for the Station have been admirably met in this part of the Manawatu district. Soil and climate are suited to the growing of a wide range of horticultural crops—vegetables, berry and tree fruits, and flowering plants—and the Station, only a mile or so from the town of Levin and within handy distance of Wellington, is readily accessible to growers from all parts of the country.

About 12 per cent of the Dominion's total area of market gardens is in the Manawatu district, which is an important source of supply of horticultural crops for the Wellington and Palmerston North markets. The district produces some 20,000 tons of vegetables annually and about 100 glasshouses provide about 200 tons of tomatoes, cucumbers, and grapes. There are no commercial pip or stone fruit orchards in the area, but there are about 35 acres in berry fruits. There are several large nurseries in the district, which is also an important supplier of cut flowers and bulbs to the Wellington market.

Growers' Appreciation

Appreciation of the great assistance given to growers by the Station in the selection and development of strains of berry fruits was expressed by Mr W. O. Roussell, president of the New Zealand Vegetable and Produce Growers' Federation.

Production of tomato seed at the Station had helped glasshouse growers in particular, the seed comparing favourably with any other in the world. The lines of seed produced by the Station were particularly suited to conditions in New Zealand and were much sought after by growers and then by merchants. Arrangements had been effected for the Horticultural Seedsmen's Association to take over multiplication, but growers were very happy indeed that production of nucleus seed remained with the Station.

The possibility that improved facilities at the Station opened up for extension of research and experimental work into vegetable production was particularly pleasing to growers, as there was room for much more work of this kind and growers realised that only at a Station such as Levin could the work so essential to this branch of the horticultural industry be done.

With expansion of the research programme at the Station, Mr Roussell said growers hoped that there would be better dissemination of the results of trials. The field day had been a very good display of work in progress and there had been great advantages to growers in seeing techniques and results. He hoped field days for growers from throughout the country could be arranged in future.

Accent on Labour Conservation

The important place the Station had in the horticultural industry and the part it was playing and would play in the more efficient and economic development of the branch of agricultural production with which it was concerned were referred to by Dr I. J. Cunningham, Assistant Director-General of Agriculture, who officially opened the new building.

The Station appeared to be exploiting one of the things for which New Zealand was famous, the conservation of labour. This had traditionally been the means of development of New Zealand agriculture generally, with the intelligent use of manpower to produce the greatest output in the world per unit of labour. It was obvious from inspecting the work at Levin that the labour content of horticultural production, that was such an important component of costs, would continue to be reduced.

Variety trials offered another way in which, by increasing output in relation to input of labour, the Station was rendering great service to the horticultural industry. By putting out to growers selected, improved strains of horticultural plants the Station was contributing appreciably to production improvements over the whole of the country.

Research stations had to be sited near centres where social and educational facilities were available for staff and their families, and the Department was fortunate that in selecting the Levin area, the climate and soils of which were held in very high regard, the civic amenities so essential to the development and progress of the Station were so readily available in the town of Levin. It was obvious from results at the Station and from the production of local growers that the district could, if it wished, take an increasing share of the already high proportion of total Dominion horticultural production contributed by the Manawatu district.

Left to right—Messrs R. G. Hamilton, Assistant Director, Horticulture Division, and W. R. Boyce, Superintendent of the Levin Station, Dr I. J. Cunningham, Assistant Director-General of Agriculture, and Mr A. M. W. Greig, Director, Horticulture Division.

Work at the Station

Principal work of the Station, much of which was illustrated in current projects displayed during the field day, relates to:

BERRY FRUIT

More than 200 new varieties introduced from overseas and local sources have been tested or are still under trial.

Improved varieties and strains are propagated for release to nurserymen and commercial growers. Among the more notable of the Station's releases are:

Strawberries: Auchincruive Climax, Talisman, and Merton Princess. (A new variety, Redgauntlet, introduced by the Scottish Horticultural Research Institute in the spring of 1957 (seed parent an American seedling, pollen parent Auchincruive Climax) is under test at the Station and will be released to growers in the coming planting season.)

Raspberries: Marcy and Taylor.

Black currants: Cotswold Cross and Goliath.

Gooseberries: Levin Early (an apparent strain of Farmer's Glory that matures a fortnight earlier than that variety).

During the past 5 years improved stock of berry fruits has been distributed to nurserymen and growers as follows: 147,000 strawberries and 38,000 other berry fruits.

RASPBERRY AND CURRANT CULTURE

Various methods of culture of raspberries and currants have been under trial for several years and data assembled on yield and labour factors affecting economics of production.

A new technique that is being tested enables the establishment of strawberries in a sward without cultivation, the grass and weed cover being destroyed by chemicals and the plants set out in the uncultivated ground and mulched. This adaptation of the method recently evolved for the establishment of pastures of improved species on uncultivable hill country excited great interest from growers and offers promising possibilities of attacking the costly bugbear of weed control in strawberries.

Also being investigated is the use of 36 in. wide polythene strips on cultivated ground through which seedling strawberries are planted in holes pierced by the point of a trowel. The polythene acts as a mulch to keep weeds in control and to keep the berries clean.

A trial area of raspberries and currants has been grassed down to investigate the possibilities of this technique commonly used by orchardists in tree fruit production.

Manuring, disease control, and chemical weed control of berry fruits are being investigated.

VEGETABLES

In addition to trials with new varieties of tomatoes from overseas, the recently introduced practice of manuring and watering glasshouse tomatoes by trickle irrigation is being tested and various fertiliser solutions used in two large aluminium framed glasshouses recently erected.

Also being developed in association with trickle irrigation is a system of automatic watering in which a tensiometer measuring soil moisture cuts in the irrigating system according to the plants' requirement of moisture.

Semi-concentrate spray application by paint spray gun has been developed at the Station and both large glasshouses have overhead air pressure pipelines for plugging in spraying equipment for convenient working of houses with a greatly reduced volume of spray material.

A large number of outdoor tomato varieties have been imported and tested.

Nucleus seed of the three tomato varieties Potentate, Money Maker, and Improved Bay State is supplied by the Station for commercial multiplication.

Electric soil warming in glasshouses is being investigated.

COMMERCIAL FLOWER CULTURE

Rose stocks have been brought in from many sources throughout the country and are being studied with a view to selection of improved strains for release to nurserymen.

Chemical weed control and disease control in flower production are being investigated.

Projected Work

Virus diseases of strawberries greatly reduce production and projected work at the Station will include the building of an insect-proof propagation house for strawberries so that virus-free stock can be introduced and maintained. It is hoped this may lead to a scheme for the distribution of nucleus stocks free from virus.

Projected work on vegetables includes the testing of seeds released under the approved vegetable seed scheme now in operation, varietal trials, and irrigation and fertiliser trials.

A 3-acre block of apples is to be established for pruning, manurial, and soil management trials. There has been no previous attempt to study the effect of pruning methods on yield of pip fruits and information from this project should be of great interest and use to orchardists.

Important Role for Station

The foregoing resume of work in progress and projected indicates the extent of the service to growers, nurserymen, and home gardeners that the Station can be expected to provide apart from its continuing main activities of the introduction and testing of new varieties of berry fruits and vegetables and the release of nucleus stocks of plants. Progress has necessarily been slow during the early years of the Station's development, but it has quickened recently with the provision of more adequate equipment and facilities and recruitment of more qualified staff with the knowledge and means to tackle problems of horticultural producers.

Growing population and increasing urbanisation of productive land are likely to highlight the importance of the sort of information the Levin Station could provide to assist growers toward improving quality and quantity of production and at the same time keep down the cost factors and labour content of their output.

Provided staff of the calibre required to develop the work planned are available, the Station should attain the importance to horticultural production that other research stations of the Department have in regard to other component parts of primary production.—*G.J.N.*

Lucerne Irrigation Trial at Winchmore

By B. A. LAUDER,
Instructor in Agriculture,
Department of Agriculture,
Ashburton

A lucerne trial under border dike irrigation.

AMONG the first trials laid down at the Department of Agriculture's Winchmore Irrigation Research Station was one designed to investigate the irrigation requirements of lucerne in Mid Canterbury. This trial is now completed, and in this article the method of establishing the lucerne and the main results obtained are described. Some suggestions for improving the performance of irrigated lucerne are also made.

AN area of 6 acres was ploughed out of old browntop pasture in the winter of 1947. The land was fallowed through the summer and in February 1948 the Ministry of Works prepared 25 border dikes each 5 chains long and 30 ft. wide. The paddock was then sown in oats for green feed with 1 cwt. per acre of superphosphate. In the spring of 1948 the land was ploughed, limed at 2 tons per acre, rebordered, and prepared for sowing.

Non-irrigated lucerne 4 years old showing the absence of grass.

Sowing

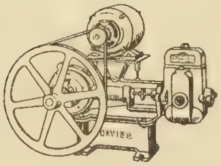
Inoculated Marlborough lucerne seed was drilled in 7 in. rows at 15 lb. per acre with 4 cwt. per acre of a 50/50 mixture of superphosphate and lime at the end of November 1948. The seedbed was in good order and a satisfactory strike and establishment of lucerne seedlings were obtained.

Establishment of the Stand

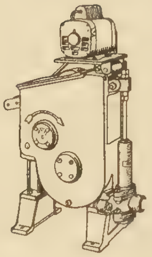
The first year after sowing was treated as a pre-trial period during which the lucerne was allowed to become thoroughly established before the application of different irrigation treatments. It was suspected that if the lucerne were subject to heavy watering too early in its life, rapid deterioration and ingress of grass would quickly follow. This suspicion seems to have been justified by later experience.

The weather after sowing was very dry and to assist establishment of the stand the whole paddock was irrigated at the end of January 1949 and again in February. The lucerne was not cut during this period but was allowed to

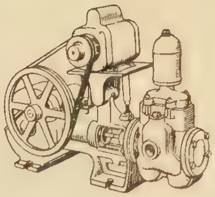
DAVIES PUMP RANGE



800 SURFACE WATER PUMP



DEEPWELL GEARING



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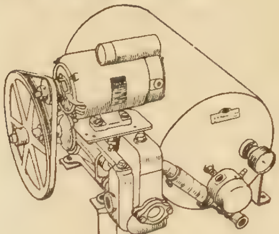
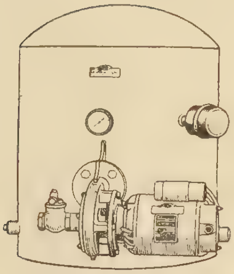


HOUSEHOLD AUTOMATIC SYSTEM



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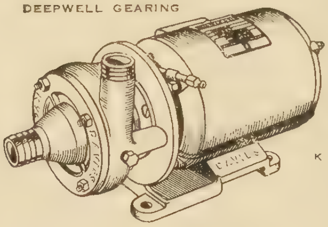
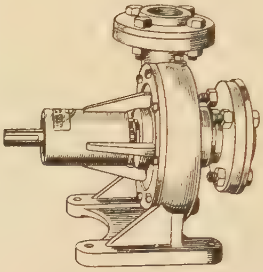


K 1/6 CENTRIFUGAL



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go into the winter with a fair amount of growth. In October 1949 the whole paddock was again irrigated and the initial cut of hay was taken in early November.

Irrigation Treatments

It was decided to include in the trial four irrigation treatments each replicated six times. The treatments chosen were:

1. Non-irrigated (control).
2. One irrigation per cut applied as soon as possible after cutting.
3. Two irrigations per cut, the first as soon as possible after cutting and the second about 3 weeks later.
4. One irrigation per cut applied as soon as possible after cutting, in alternate years only.

It was realised that these treatments were by no means ideal. They would, for example, make no allowance for wet and dry years. But the farmer is supplied with water for irrigation on a roster system and would be likely to adopt either treatment 2 or 3. Treatment 4 was included to find out how lucerne would behave under intermittent irrigation.

The response to irrigation is shown by the two border-diked areas in the foreground compared with the unirrigated area in the background.

A soil profile of Lismore stony silt loam, showing about 12 to 14 in. of a stony soil overlying shingle.

In practice treatment 2 received three or four irrigations per year at intervals of 6 to 8 weeks and treatment 3 six to eight irrigations at intervals of 3 to 4 weeks. The amount of water applied at each irrigation is not precisely known, but would probably approximate 6 acre-inches per acre, that is, a depth of 6 in. over the area irrigated.

The soil on which this trial was conducted, known as Lismore stony silt loam, is typical of the light to medium soils over much of the Canterbury Plains. Topsoil and subsoil together have a depth of about 16 in. and beneath this are very deep beds of gravels. Drainage is therefore no problem and within 24 hours of irrigation the soil is drained of free (gravitational) water and the surface is firm.

This soil has an available moisture holding capacity of about 3½ in. in topsoil and subsoil combined, but plants such as lucerne which root into the underlying gravel probably obtain some additional supplies from there.

Lime and Fertiliser Applications

Lucerne, whether irrigated or non-irrigated, commonly receives only carbonate of lime and superphosphate in Mid Canterbury. Potassic fertilisers have been used from time to time, but generally with little or no effect on yield.

Over the 6-year period the trial stand received 3½ tons of lime and 15 cwt. of superphosphate per acre, including the amounts applied at and just before sowing.

From 1952 onward the effect of potash applications, consisting of 2 cwt. per acre of muriate of potash in two 1 cwt. dressings, was measured. The application of muriate of potash gave occasional slight increases in yield with a tendency to increase as time went on, and the impression was gained that on plots receiving potash the ingress of grass was slowed down.

Climate

Weather during the trial may be described as a fair sample of the climate of the plains. Included in the 6-year period were three fairly wet and three fairly dry years, as indicated by the rainfall during the growing season.

Year	Rainfall in inches, September to April inclusive
1949-50	23
1950-51	32
1951-52	16
1952-53	37
1953-54	16
1954-55	15

Measurement of Yields

The method of measuring yields was briefly as follows: As soon as the lucerne was cut a sample plot 6 ft. wide and 1 or 2 chains long was raked up and weighed green on each border dike. A sample of lucerne from each plot was taken at this time so that the dry matter percentage could be found. In this way the yield from each border dike was calculated and expressed in pounds of dry matter per acre.

Dry hay usually contains about 15 per cent of water, so 85 lb. of dry matter would be equivalent to 100 lb. of hay. However, considerable loss of material occurs during haymaking in a paddock and the yield of hay may be considerably lower than the total yield of dry matter cut. This difference between dry matter yields and hay yields is not important when treatments are compared, since all yields are on the same basis (dry matter), but it should be realised that the figures obtained in this experiment refer to dry matter and not to hay.

Results of Treatments

The table is a summary of the average annual yields of dry matter obtained from each irrigation treatment over the 6 years. Treatment 4 has been omitted as being of no practical significance.

Irrigating before the first cut resulted in no increase in yield. There was in fact a slight depression whether one or two irrigations were applied.

AVERAGE YIELDS OF LUCERNE IN POUNDS PER ACRE OF DRY MATTER, 1949-55

Cut	Non-irrigated	1 irrigation per cut	2 irrigations per cut
1	2,460	2,360	2,250
2	2,100	2,630	2,750
3	1,210	1,900	1,980
4	480	1,480	1,380
Total of 4 cuts ..	6,250	8,370	8,360

One irrigation applied after the first cut produced a 25 per cent increase in yield. A second irrigation resulted in little further increase in yield.

One irrigation applied after the second cut resulted in over 50 per cent increase in yield. A second irrigation gave no further worth-while increase.

One irrigation applied after the third cut trebled the yield. A second irrigation produced no further increase.

The average yearly increase in yield of dry matter amounted to 33 per cent from one irrigation per cut. There was no further increase from a second irrigation per cut.

The yield figures given clearly show that this 33 per cent increase in annual production of dry matter could have been obtained by applying one irrigation after the first, second, and third cuts. However, in arriving at this figure no allowance has been made for growth produced by lucerne which has not been irrigated and which is too short to cut with the hay mower (third and fourth cuts in dry years).

The chief problem in growing lucerne under irrigation is its short useful life. Thinning out of the stand accompanied by ingress of grasses usually occurs after 2 or 3 years of irrigation. After this, response to irrigation declines. In the trial described it was found that the rate of degeneration of the lucerne and of invasion by grasses was roughly proportional to the number of irrigations applied. After the final cut had been taken in autumn 1955 the trial was inspected and the future usefulness of the lucerne under each irrigation treatment was assessed. The following conclusions were arrived at:

Treatment 1 (non-irrigated): The density of lucerne plants was still high; weed grasses (browntop) were not very aggressive. The stand is capable of good production for a number of years.

Treatment 2 (one irrigation per cut): There was some thinning out of lucerne; weed grasses (browntop) were much more aggressive than in Treatment 1. The stand should have a useful life of 1 to 2 years and possibly longer.

Treatment 3 (two irrigations per cut): There was marked thinning of lucerne; weed grasses (browntop) were very aggressive and forming a tight mat. The stand should be ploughed.

Treatment 4 (one irrigation per cut in alternate years only): There was some thinning of lucerne; weed grasses (browntop) were very aggressive. The stand looked poor, but probably was capable of reasonable production for 1 or 2 years.

During the last 2 years of this lucerne irrigation trial various treatments aimed at arresting the decline in yields were applied. They included:

Cultivation with a grubber fitted with narrow points followed by tine and chain harrowing.

Chemical control of invading grasses with TCA.

Using the lucerne as a run-off from swedes during winter and feeding out lucerne hay.

Though good control of weed grasses (mainly browntop) was obtained by cultivation and especially by the use of TCA, only the return of fertility by feeding back hay removed gave any indication of arresting the decline in yields. This trial was started too late to enable any definite conclusions to be drawn on the effect of keeping the stand weed free.

It is reasonable to suppose that transference of fertility back to the lucerne accompanied by trampling and grazing of winter-growing grasses would be beneficial to lucerne grown for hay, which in normal practice suffers a heavy drain of fertility in the hay removed each year.

Recommendations

1. Since lucerne produces, on the average, two good cuts of hay without irrigation, no water should be applied until after the first and second cuts have been taken. The first irrigation for the season should be as soon as possible after the second cut and the next immediately after the third cut.

Some modification of this scheme might be necessary in very wet or very dry years. For example, if January and February are exceptionally dry months, an extra irrigation for the third and fourth cuts might be necessary. On the other hand, in years of high summer and autumn rainfall irrigation may be dispensed with without any loss of yield. However, adoption of the first recommendation should give generally satisfactory results not only in regard to yields but also in helping to prolong the useful life of the irrigated stand.

2. Soil moisture is only one of the factors affecting the yield of lucerne. Without fairly liberal topdressing, response of lucerne to irrigation is disappointing. Generally, only lime and superphosphate are required in Mid Canterbury. A suitable liming and manuring programme for irrigated lucerne is as follows:

Lime

Apply 1 ton of lime per acre 1 year before the lucerne is sown and a further ton per acre immediately before sowing. Topdress with ½ ton per acre every second year.

Fertiliser

Serpentine superphosphate should be applied at 3 cwt. per acre annually in August or preferably 1½ cwt. in August and 1½ cwt. after the first or second cut.

The manurial requirements of irrigated lucerne are being investigated at Winchmore at present and within the next few years more detailed recommendations should be available.

Common Plants Poisonous to Stock

FORTUNATELY plant poisonings in stock are relatively infrequent, with only the odd animal being affected, but occasionally losses are serious. A better knowledge of the plants responsible and the effects produced may assist farmers in reducing stock losses to negligible proportions. The information in this article was given in a paper presented at the 1958 Ruakura Farmers' Conference by M. R. Coup, Senior Scientific Officer, Department of Agriculture Ruakura Animal Research Station.

A POISONOUS plant is one which when eaten by an animal in sufficient quantities causes sickness or death. The plant generally contains a substance or group of substances which are toxic. If these are removed or destroyed, the remainder of the plant may be highly nutritious. Thus, the fruit of the karaka (*Corynocarpus laevigata*), though poisonous in the fresh state, becomes safe after being boiled or baked; this fact was known to the Maoris, who used the karaka berry as a staple food. Incidentally the leaves of this plant are not only harmless but even nutritious to stock. Again, some of the buttercups, such as waoriki (*Ranunculus rivularis*) and the celery leaved buttercup (*R. sceleratus*), in the young fresh state are poisonous to all classes of stock, particularly cattle, but lose their toxicity on drying and so may be included in hay with impunity. Fortunately owing to their acrid taste and smell, buttercups are not eaten to any great extent by stock.

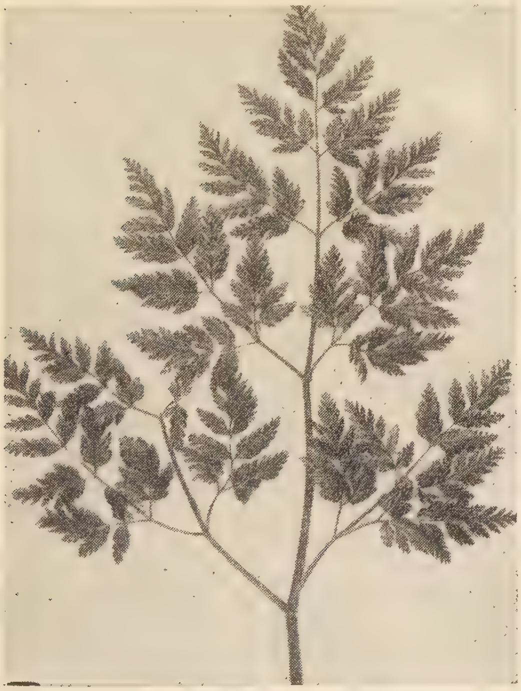
The substances in plants which cause them to be poisonous are many and varied, some known but many still unknown. Most are organic compounds but nitrate and selenium (the latter an important cause of poisoning in North America) are examples of inorganic poisons, though of plant origin.

The most important group of plant poisons are undoubtedly the alkaloids, though many of the alkaloids are also valuable drugs for both man and beast. Glycosides are another important group of plant poisons. These break up to give sugars plus a poison, such as prussic acid. Other plant poisons are nitrates, oxalates, saponins, picrotoxins, oils, and resins.

The actions of the poisons within the animal body are also many and varied, some affecting the blood, some the digestive system, and some the liver, muscles, nerves, brain, heart, or kidneys.

Before giving individual descriptions of some of our commoner poisonous plants, with the symptoms produced and the types of poisons involved, I do wish to stress that in the poisons field the two main killers of stock are still **lead** and **arsenic**. However, it is not the purpose of this paper to deal with this aspect of stock poisoning.

- A number of different plant substances can cause stock poisonings.
- Some plants are poisonous only when fresh; others are equally toxic when dried.
- Cut or wilted plant material is often more attractive to stock than fresh growing material. The use of weedkillers on plants may also increase their palatability.
- Outbreaks of fodder beet poisoning are the result of gorging.
- As many garden plants are poisonous to animals, garden waste such as shrub and hedge trimmings should be disposed of carefully.
- Hungry travelling stock are particularly prone to plant poisoning.



Hemlock.

Hemlock

A very good description of hemlock (*Conium maculatum*) together with coloured plates of hemlock and another similar, though harmless, plant fennel (*Foeniculum vulgare*) appeared in the March 1958 issue of the "Journal". The description of hemlock in contrast to fennel given in that article was as follows:

> Hemlock has a musky smell, leaves like parsley, small white flowers, and purple blotches on the stems, which are hollow right up to the top of the plant. Fennel has a rather sickly smell, something like that of aniseed, needle-like leaves, small yellow flowers, and unblotched stems, the topmost ones completely filled with white, spongy pith.

Hemlock is poisonous to both humans and stock, its poisonous properties having been recognised down through the ages. In general single-stomach animals are more prone to its effects than are ruminants, but cattle, horses, pigs, sheep, and even elephants have been poisoned by it.

Hemlock contains a number of deadly alkaloids, of which coniine occurs in the greatest amount. This alkaloid has a peculiar mouse-like odour and it is this smell which is noticed when the plant is crushed.

The chief symptom of poisoning is a gradual paralysis which sets in within a few hours of the plant being eaten. No specific treatment is known.

The use of weedkillers can make many dangerous weeds more attractive to stock—possibly due to the resultant wilting. Thus stock will eat sprayed hemlock in preference to unsprayed. Again, many of the high-nitrate plants may thus be made more palatable to animals and lead to nitrate-nitrite poisoning.

English Yew

The old English tree the yew (*Taxus baccata*) grown throughout New Zealand as hedges or single trees in gardens, parks, and cemeteries is particularly poisonous. Losses in cattle have been reported in this country on a number of occasions. In Europe

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cattle, horses, and pigs have been affected.

Though the leaves, bark, and particularly the seeds are poisonous, generally only the leaves and smaller twigs are eaten.

A serious case of yew poisoning occurred among 30 calves bought at the saleyards and held overnight in a park in which were growing a number of shrubs, including English yew. The latter was evidently particularly attractive to the calves, which had been in the saleyards all day. In the morning 7 were dead. The 23 survivors were resold and by the following morning a further 6 were dead.

Yew trimmings, as with so many other garden trees and shrubs, are often disposed of over nearby fences, to become available to stock. In this cut condition yew foliage appears particularly attractive to stock.

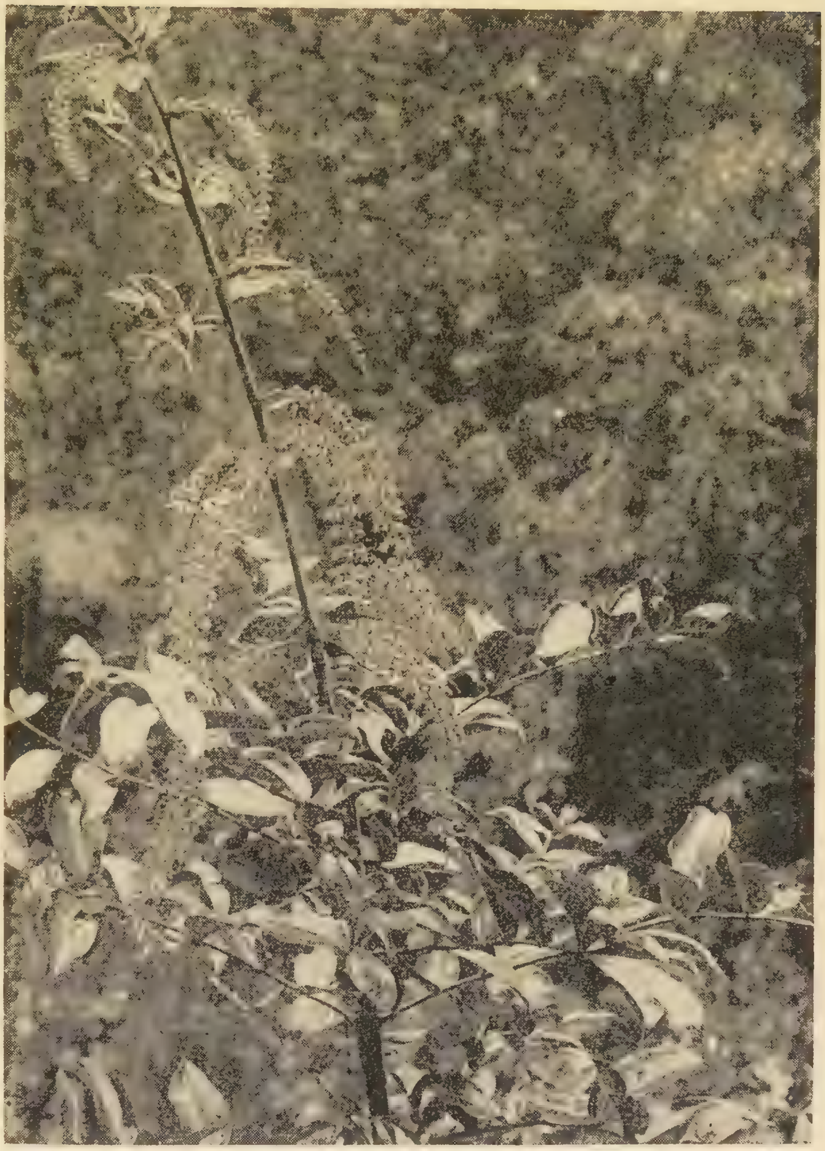
The symptoms of poisoning by this plant may be blowing and trembling and then sudden death, the animal often dropping as if shot. The poison is the very toxic alkaloid taxine.

Tutu

Tutu (*Coriaria arborea*) can be regarded as one of the deadliest of New Zealand native plants and has been the cause of losses in stock from earliest farming times. It is abundant on river banks, on roadsides, and in bush and scrub land throughout New Zealand.

Practically all parts of the plant are poisonous. Cattle and sheep are the animals mainly affected, though here again elephants appear to be susceptible.

The poisonous substance is tutin. Usually travelling or hungry stock are affected, the symptoms being excitement, convulsions, coma, and death. There is no specific treatment. Where eradication is impracticable the only control measure available is the provision of adequate feed in paddocks and on stock routes where tutu is present.



Tutu has been the cause of losses in stock from earliest farming times.

Ragwort

Ragwort (*Senecio jacobea*) needs no introduction to the New Zealand farmer, but its poisonous properties are, perhaps, less well known.

In the early days of farming in New Zealand horses were frequently affected by the so-called "Winton" disease, but for obvious reasons poisonings in this animal are uncommon today.

Ragwort owes its toxicity to the liver damaging alkaloid jacobine. The whole of the plant is toxic, both in the fresh and dried state. Thus, hay or dried grass contaminated with ragwort can be particularly dangerous, as stock are unable to exercise their natural selective feeding.

Ragwort poisoning of horses and cattle usually follows a chronic course, symptoms being noticed only after months of feeding. In fact, the ill effects sometimes show up some considerable time after removal of the stock from the ragwort area. However, acute poisoning, mainly of cattle, may develop within a week after feeding of heavily contaminated hay, dried grass, or pasture.

Among other signs cattle show unthrift and diarrhoea and horses dullness, unsteadiness, and aimless wandering. Jaundice is usually a prominent feature.

Poisoning in Sheep

Sheep are somewhat less susceptible to ragwort poisoning than are cattle and horses, but if they graze on ragwort infested country for sufficient time, usually about one year, signs of chronic poisoning become evident. Affected sheep gradually lose condition, develop a chronic scour, and finally develop jaundice and die. These effects are caused by damage to the liver.

One important respect in which ragwort poisoning differs in sheep is that the damaged liver is unable to get rid of copper, so that the copper content steadily increases until often it reaches such a level that copper poisoning occurs. This is shown by a sudden breakdown in the red cells of the blood, and leads to marked jaundice and redwater. This sequence

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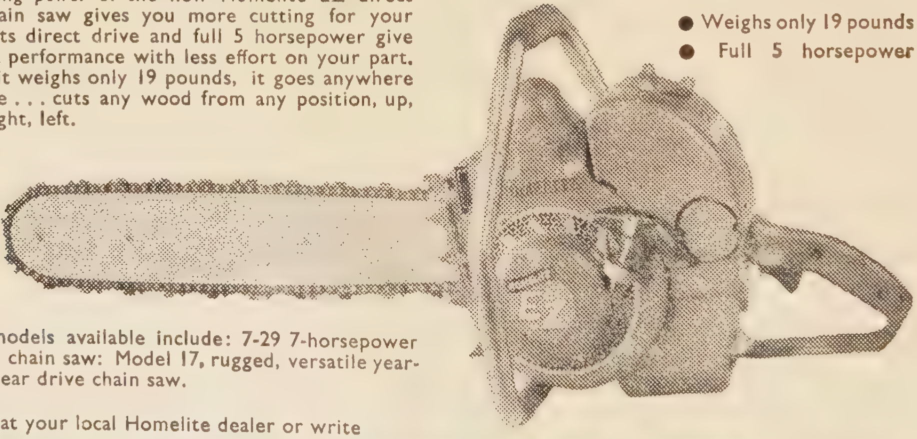

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At least two types of thistle can cause nitrate poisoning—variegated thistle (above) and winged thistle (right).

of events may be hastened by certain precipitating causes such as holding sheep for a few days in yards or trucks, transferring sheep from ragwort to improved pastures, particularly clover-dominant pastures (which are higher in copper than grass), or raising the copper level by dosing against worms with copper drenches.

Jaundice, particularly of the liver, red-black kidneys, and red urine are often observed in the dead animal. Chemical analyses usually show over 1,000 parts per million (on a dry matter basis) of copper in the livers from such cases (even figures of over 3,000 are not uncommon) in comparison with normal values for mature sheep of about 400 parts per million.

No treatment for ragwort poisoning is known and prevention by eradication of the ragwort appears to be the only course. Stocking with sheep at a high rate per acre to eat out the weed quickly is probably the safest course. This is best done with a "flying flock" in which the sheep are fattened and sold before liver damage is severe enough to cause losses.

Nitrate Poisonings

A number of plants have been incriminated as causing nitrate poisoning. Nitrate as such is in fact relatively harmless, but given the right conditions bacteria readily convert nitrates to highly poisonous nitrites. As an example of this, research workers in America have shown that about half the nitrate present in oat hay was reduced to nitrite in less than 24 hours after wetting and exposure to air. The bacteria of the stomach may also reduce the nitrate to the potent toxin nitrite. This substance interferes with the oxygen-carrying capacity of the blood. Animals so affected may die from simple lack of oxygen. There is some evidence that symptoms are less severe and recovery is more rapid in well fed than in poorly fed animals.

Pregnant stock surviving the effects of eating plants high in nitrate may abort. This is due to the cutting off of vital oxygen supplies to the unborn calf or lamb and its consequent death. This may well account for some of the "unexplainable" abortions which occur from time to time.

After consumption of the toxic material, nothing untoward is to be noted for several hours, the period required for the conversion of nitrate to nitrite to take place. Staggering, laboured breathing, and possibly muscle twitching may then set in and the animal may go down and be unable to rise.

Fortunately the antidote methylene blue is available and prompt assistance from a veterinarian may save affected animals. On the other hand, no symptoms may have been noticed, and dead animals only may be found. In either case the survivors should be removed to a safe area.

In general cattle are chiefly affected, pigs only on certain crops, and sheep and horses rarely. As with most plant poisonings, hungry stock are most prone to this affection. In New Zealand the following plants have been shown to cause nitrate poisoning:

Immature turnip tops.

Green feed oats.

Mangel roots—pigs and cattle affected.

Short-rotation (H1) ryegrass in combination with rape—sheep affected.

At least two types of thistle: Winged thistle (*Carduus tenuiflorus*) and variegated thistle (*Silybum marianum*).

The all-too-prevalent farm weed redroot (*Amaranthus retroflexus*).

In most cases the nitrate content of the plant responsible was over 5 per cent (calculated as KNO_3 on a dry-matter basis).

Nitrate poisoning usually occurs in autumn during or subsequent to a period of drought except with mangel

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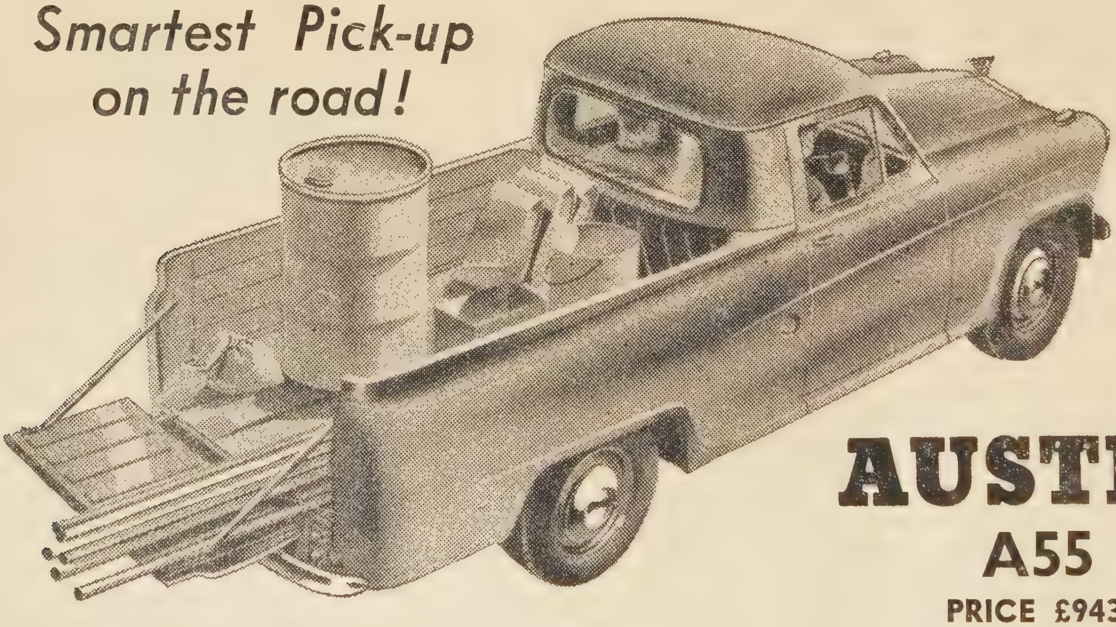

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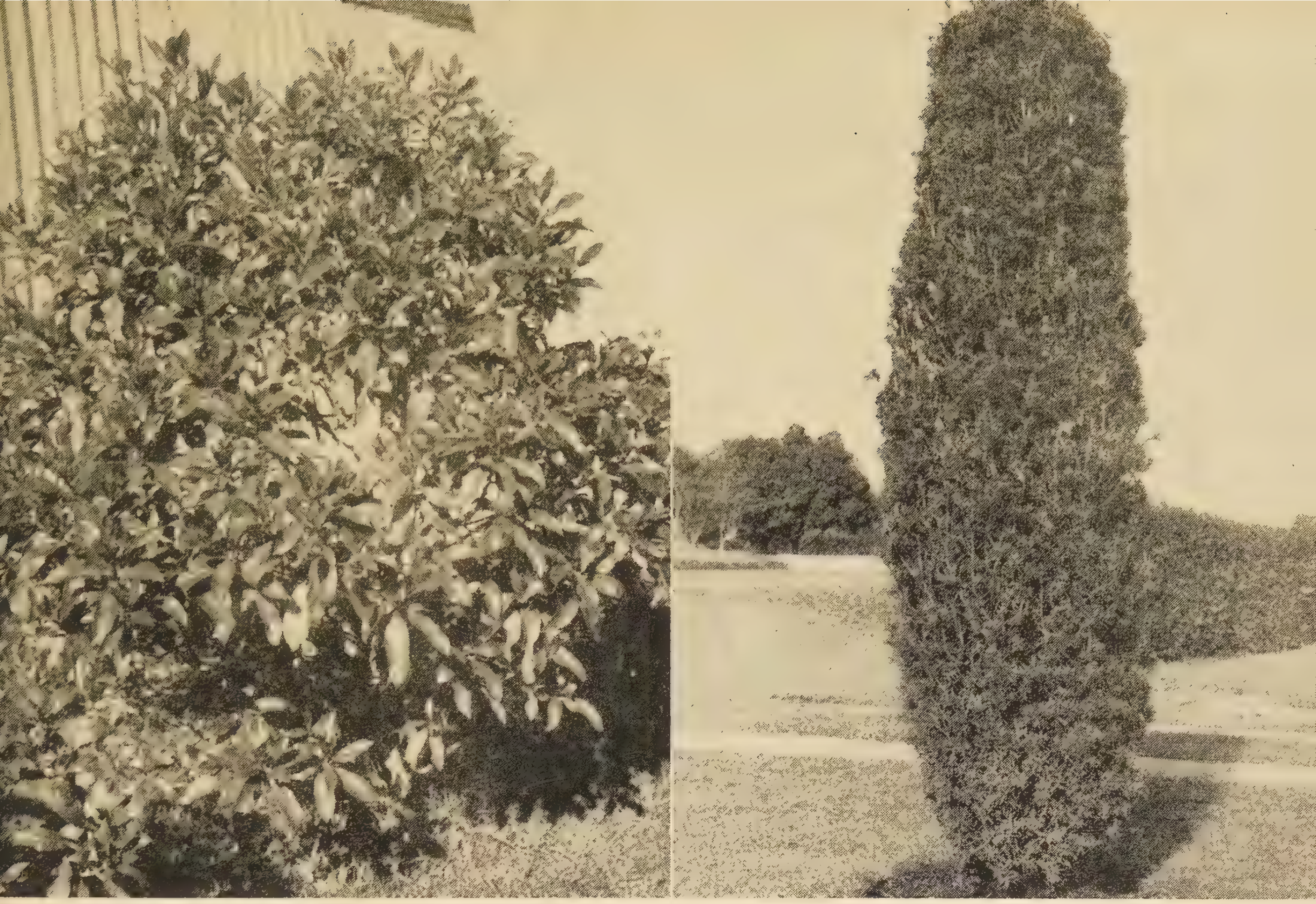

Unsuspected yet dangerous plants—ngaio (left) and yew (right).

roots. Here the incidence appears greatest with immature roots or those showing regrowth of tops. The feeding of improperly cooked mangels to pigs has had disastrous results.

The characteristic feature of nitrate poisoning is the chocolate brown colour of the blood taken from the sick or recently dead animal.

If trouble occurs on any of the previously mentioned feeds, remove the survivors to a safe place and call your veterinarian promptly. He may be able to save animals subsequently affected and confirm your tentative diagnosis.

Fodder Beet Poisoning

Fodder beet is a valuable crop for the feeding of pigs, cattle, and sheep, but when fed in excessive quantities to cattle it can cause digestive upsets and even death.

Over the years several outbreaks of fodder beet poisoning, particularly in cattle, have occurred. The histories of such outbreaks are usually much the same—that of the animals getting more than their usual ration of roots, often as the result of their having broken into the crop overnight. This gorging of such high carbohydrate fodder results in a particularly unbalanced ration and, as with wheat poisoning as experienced in Australia, digestive upsets and often acute poisoning follow.

A number of trials with fodder beet roots have been undertaken at Ruakura to follow the course of the poisoning, ascertain the safe upper limit of intake, check on varietal differences, and, if possible, find out the nature of the toxin or toxins responsible for death.

Such trials were run using sheep as the test animals and dosing with juice expressed from the beet roots. Parallel trials were run in which ordinary cane sugar was dosed. Beet juice and cane sugar gave almost identical responses. The rumen contents became highly acid owing to the formation of large amounts of lactic acid. Dullness and diarrhoea were constant features in both cases. But whereas with the beet juices there was usually death within 36 hours, animals dosed with cane sugar eventually recovered.

Different varieties of fodder beet showed markedly different potencies and it was not possible to ascertain the nature of the toxin or toxins causing the quick deaths. From the work done it is possible to recommend the maximum safe level of intake of fresh beet roots as 6 lb. for a 100 lb. sheep and 60 lb. for a 1,000 lb. cattle beast.

Bracken Fern

Bracken fern (*Pteridium esculentum*) is a particularly common plant throughout New Zealand. However, on occasions in certain localities it gives rise to poisonings and death. Cattle are the animals chiefly affected, though poisonings in sheep have also been recorded. In the United States horses are frequently affected.

The toxic principle affecting horses has been shown to be thiaminase, which destroys vitamin B_1 (thiamin), but the nature of the toxin which affects cattle and sheep is not known.

Generally 1 to 2 months' feeding of bracken appears to be required. Cases frequently occur some time after removal of susceptible animals from the fern area.

Cattle may be found dead or suffering from dullness, lack of appetite, and showing blood in the faeces, together with bloody discharges from the nostrils, eyes, and vagina. Death follows in from 12 to 72 hours after first appearance of signs. The dead animal shows extensive haemorrhages in the gut and under the skin. No treatment for cattle or sheep is as yet available.

In the horse the symptoms are, among others, muscle tremors and lack of muscular control. The dead

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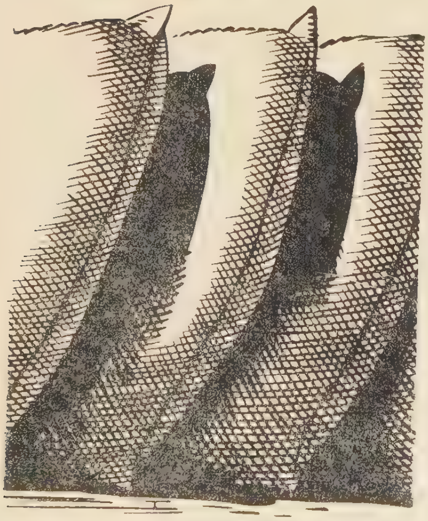

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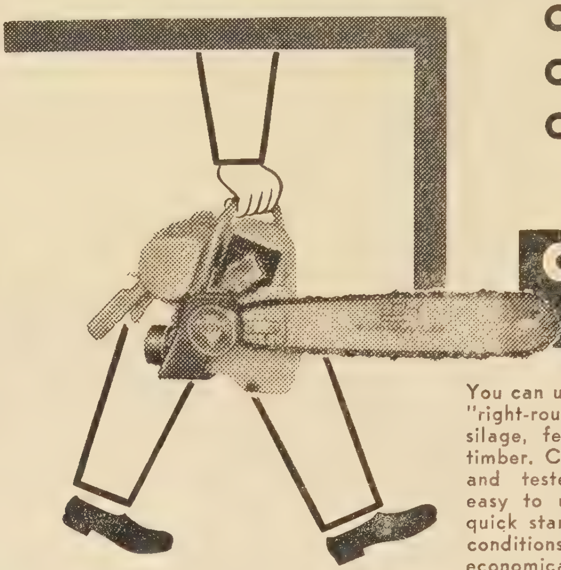

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animal shows haemorrhages. Administration of vitamin B_1 is effective in the horse. Until we can ascertain the nature of the toxin responsible for bracken fern poisoning of cattle little progress in its prevention and control can be made.

Macrocarpa

Though macrocarpa (*Cupressus macrocarpa*) is so widely grown throughout New Zealand, the incidence of trouble through stock eating it is relatively low; however, there are numbers of reports of abortions in cows which have eaten it.

Experimental feeding has resulted in abortions in 7 to 10 days, but in the field a shorter period is more common (1). Abortions are observed only in late pregnancy and usually several cows are affected at about the same time. Retention of the afterbirth, dullness, and lack of interest in feed are common symptoms.

In typical outbreaks stock have had recent access to macrocarpa after tree felling, branch lopping, hedge trimming, or severe storms. Fortunately no permanent effects on health or fertility are produced.

Ngaio

The ngaio (*Myoporum laetum*) is a shrub or small tree often 10 to 25 ft. high with spreading branches, sticky at the tips and bearing bright green leaves which are characteristically studded with glands which show up clearly when the leaf is held up to the light. Ngaio occurs chiefly in coastal areas of both islands to as far south as Otago.

On Banks Peninsula a serious outbreak of poisoning occurred in 1945 after the breaking down of branches during a storm; 73 cattle were fatally poisoned. Each year ngaio is responsible for livestock losses, chiefly as a result of broken branches or clippings becoming available to stock.

Deaths are more common in cattle, but pigs, horses, and sheep are also susceptible. In acute cases the affected beast shows dullness, lack of appetite, and abdominal pain. Hard, dry, bloodstained dung is passed and jaundice may be evident. Examination of the carcass shows intense inflammation of the stomach and gut. In less severe cases there is pronounced sensitivity to light, together with swelling of the ears, head, udder, and skin of the back, followed by cracking and peeling off of much of the affected skin. There is lack of appetite and sometimes jaundice. An oil, present mainly in the leaves, has been shown by experiment to give reactions similar to those seen in the field (2).

There is no specific treatment, though shade should be provided to reduce photosensitivity effects.

Rhododendron

Rhododendron and related species are toxic to most domestic animals. An outbreak of rhododendron poisoning in sheep recently came under our observation after leaves of cut rhododendron bushes had been eaten.

The poison in rhododendron has a powerful emetic action and it will even make the hardy old goat sick! The symptoms observed in our cases were excessive salivation, laboured respiration, and lack of muscular control.

In yet another case *Pieris* (formerly *Andromeda*) *japonica*, commonly known as Lily of the Valley Tree, which belongs to the same family as rhododendron, caused poisoning in sheep.

Many other garden plants have been shown, both here and elsewhere, to be poisonous to domestic animals. It is wise, therefore, to treat all such plants as potentially poisonous. In particular I would emphasise that garden trimmings can be both attractive and dangerous to stock.

Acknowledgments

Much information contained in this article has been gathered from Connor's "Poisonous Plants in New Zealand" (3).

References

(1) Ruakura Animal Research Station Annual Report 1951.

(2) Cunningham, I. J., and Hopkirk, C. S. M. (1954): "New Zealand Journal of Science and Technology", 26 (Sec. A), p. 333.

(3) Connor, H. E., "Poisonous Plants in New Zealand", Department of Scientific and Industrial Research Bulletin No. 99 (1951).

* * *

Agricultural and Pastoral Show Dates

THE following are dates and venues of A. and P. shows up to the end of March:

NORTH ISLAND

January

17 January—Central Hawke's Bay A. and P. at Waipukurau.

*23 and 24 January—Feilding I., A., and P. at Feilding.

28 January—Marton District A. and P. at Marton.

*30 and 31 January—Horowhenua A. and P. at Levin.

31 January—North Kaipara A. and P. at Paparoa.

February

5 February—Te Kauwhata A. and P. at Te Kauwhata.

6 and 7 February—Rodney A. and P. at Warkworth.

7 February—Rangitikei A. and P. at Taihape.

7 February—Woodville A. and P. at Woodville.

*10 and 11 February—Dannevirke District A. and P. at Dannevirke.

11 February—Te Awamutu A., P., and H. at Te Awamutu.

13 and 14 February—Taumarunui A. and P. at Taumarunui.

13 and 14 February—Taranaki A. and P. at New Plymouth.

14 February—Otorohanga A. and P. at Otorohanga.

14 February—Pahiatua A. and P. at Pahiatua.

14 February—Opotiki A. and P. at Opotiki.

14 February—Hukerenui A. and P. at Hukerenui.

19 February—Matamata A. and P. at Matamata.

*20 and 21 February—Masterton A. and P. at Masterton.

20 and 21 February—Te Kuiti and District A. and P. at Te Kuiti.

20 and 21 February—Franklin A. and P. (70th Annual Show) at Pukekohe.

21 February—Waiapu P. and I. at Ruatoria.

21 February—Northern Wairoa A. and P. at Mititai.

21 February—Whakatane A. and P. (50th Jubilee) at Whakatane.

25 February—Morrinsville A. and P. at Morrinsville.

27 and 28 February—Wellington and Hutt Valley A. and P. at Trentham.

27 and 28 February—Ohura A., P., H., and I. at Nihoniho.

*28 February—Waimarino A., P., H., and I. at Raetihi.

28 February—Putaruru A. and P. at Putaruru.

28 February—Te Puke A. and P. at Te Puke.

March

7 March—Waiotira Junction A. and P. at Waiotira.

*7 March—Mangonui County A. and P. at Kaitaia.

7 March—Albany A. and P. at Albany.

7 March—Tauranga A. and P. at Tauranga.

14 March—Kumeu District A. and H. at Kumeu.

20 and 21 March—Wellsford A. and P. at Wellsford.

21 March—Poverty Bay Autumn Carnival at Gisborne.

SOUTH ISLAND

January

17 January—Waikouaiti A. and P. at Waikouaiti.

24 January—Waiau A. and P. at Tuatapere.

24 January—Golden Bay A. and P. at Takaka.

24 January—Palmerston and Waihemo A. and P. at Palmerston.

27 and 28 January—Otago A. and P. at Dunedin.

31 January—Banks Peninsula A. and P. at Little River.

*31 January—Peninsula Horse Show and A. and P. at Duvauchelle.

February

14 February—Inangahua A. and P. and Sports Association at Reefton.

*14 February—Central Otago A. and P. at Omakau.

*21 February—Maniototo A. and P. at Ranfurly.

21 February—Murchison A. and P. at Murchison.

*28 February—Kaikoura A. and P. at Kaikoura.

March

7 March—Mount Benger A. and P. at Roxburgh.

7 March—Temuka and Geraldine A. and P. at Winchester.

7 March—Amuri A. and P. at Rotherham.

*14 March—Cheviot A. and P. at Cheviot.

14 March—Upper Clutha A. and P. at Wanaka.

14 March—Mayfield A. and P. at Mayfield.

21 March—Methven A. and P. at Methven.

*21 March—Hawarden A. and P. at Hawarden.

30 March—Strath Taieri A. and P. at Middlemarch.

30 March—Mackenzie County Highland Show at Fairlie.

* The Department of Agriculture exhibit will be staged at this show.

History of Fruitgrowing in Nelson

NELSON has been known as a fruitgrowing province for many years, and its fruitgrowing history dates back to 1865, when the first commercial orchard of an acre of mixed fruits was planted near Riwaka. It is now the major pip fruit growing area in New Zealand and exports considerable quantities of apples. The period over which fruit has been grown commercially in Nelson covers two distinct eras, the change from one to the other occurring in 1911, when large-scale apple tree planting for production of export fruit began on the Moutere Hills. Before this, orchards were mainly of mixed types and much of the fruit available for disposal was the surplus from farm orchards. N. J. Adamson, Horticultural Superintendent, Department of Agriculture, Nelson, who has had a long association with fruitgrowing in the province, describes in this article the growth of the industry from small beginnings to its present major importance in the economy of Nelson. The article will be concluded in next month's "Journal".

FRUITGROWING in Nelson Province has been confined to Waimea County, where the sheltered position, high proportion of sunshine, and well-distributed rainfall provide very favourable conditions for cultivating fruit, tobacco, hops, and tomatoes and other market garden crops. Sunshine frequently exceeds 2,500 hours in a year, and rainfall in the region varies from 38 in. per year to more than 50 in. Frosts are uncommon from the end of October until mid-April, so that frost damage to horticultural crops is rare.

Such a favourable climate encouraged early settlers to grow fruit for their own needs as they could procure the trees; and some enterprising farmers, seeing the encouraging results, planted more than they required in expectation of selling the surplus in the growing towns. In this way fruitgrowing in the province began, but it was about 20 years after the founding of the Nelson colony that the first commercial orchard was planted.

Nelson was settled in 1841, when the preliminary expedition of the Nelson colony, under the leadership of Captain Arthur Wakefield, R.N., after much searching for a suitable location for the settlement, finally camped on the site of what is now Nelson City in October of that year. In 1842, 800 immigrants arrived and other settlers soon followed.

Spreading out in Search of Productive Land

For many years the main activity of the early arrivals was providing the barest necessities for existence. Too many settlers had arrived in the first year and food was scarce. These circumstances probably forced settlers to move out early in a wide search

▲ Orchards, including Appleby Research Orchard, in the Moutere Hills district. (Coastal inlet in foreground.)

for productive land. At first the only communication was by ship, as there were no land routes.

Small ships built locally from hand-sawn timber could work small harbours and beaches. Thus a number of the pioneer settlers chose Motueka and Riwaka quite early for their homes, as these places were approachable by sea and the soil appeared fertile. These districts later became centres of horticultural production, and remain so, with fruit, hops, and tobacco the main crops.

Early Plantings

A number of small wooden ships served Nelson in the early days and the brigantine Comet of 100 tons began trading regularly with Sydney. By 1853 Nelson had services with Sydney, Wellington, and Canterbury.

As settlement progressed people soon turned their attention to growing the trees and fruits they had known in the Old Land. Their needs were supplied largely from Australia, the nearest source, though the earliest settlers had brought peach stones and fruit pips and trees carefully nursed on the long voyage. Hop gardens were established in the Nelson township soon after the first landings from sets brought from England.

Fruitgrowing apparently progressed more in the Riwaka and Motueka districts than elsewhere in the province. These districts were still centres of much fruitgrowing activity when the first experimental shipment of apples was made to England in 1908 and before the planting boom on the Moutere Hills began in 1910. The record of fruitgrowing in Motueka and surrounding districts is also a record of early commercial fruitgrowing in the province.

The first commercial orchard (of 1 acre) was established about 1865 by G. Stevens at Dehra Doon, near Riwaka. It consisted of apples, pears, and plums. Stevens, one of the New Zealand Company's surveyors, surveyed the Riwaka district. There is no sign of this orchard now, though a very old pear tree still growing in the locality is thought to have been part of it.

About the same time an orchard of 3 acres was planted by Robert McNabb at Sandy Bay. Epps Seedling and Northern Spy were among the apple varieties grown, which included a number now long forgotten. In later years some of these trees produced up to 30 bushels of apples each and fruit was shipped direct to Wellington from the old Riwaka wharf.

At that time, with the Motueka River hampering free access to the Motueka area, Riwaka appears to have been the community centre and the main farming area, and it developed ahead of Motueka. Except for the planting of farm orchards, commercial orchard planting did not develop further until the late 1870s when three orchards in Riwaka and one up the Motueka River valley were planted. These were Clement Bamfield's (now part of Mr H. B. Everett's), H. C. Jacka's (now Mr B. T. Rowling's), and T. Pattie (now Mr A. Scott's).

▼ Orchards at Tasman.

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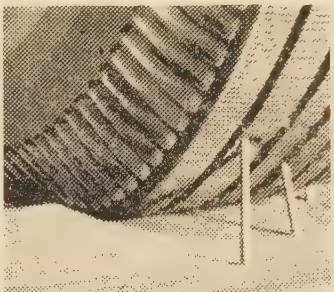

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Packing apples for export in a Nelson orchard in 1911.

The Motueka Valley orchard, long since disappeared, was planted by Bartholomew ("Barty") Lloyd, whose 5-acre mixed orchard supplied most of the fruit used in a local jam factory. Apples from this orchard, which had been greatly extended, were later included in some of the first trial shipments to England.

Further orchard plantings in Riwaka followed soon after those mentioned above, the next being those of S. Starnes (later F. Hamilton's, but now pulled out) and H. Everett's. R. Chapman planted a small orchard (now pulled out) at Shaggery. Most of the trees in these orchards were grown on seedling stocks raised by Chapman and Grooby, who had the first tree nursery in the province.

Replacement and Removal of Trees

Though the earlier-planted pip fruit trees have disappeared, it was not because trees died or became diseased and unthrifty, but because the varieties grown became out of date or the land was required for other purposes. The seedling stocks of that time proved just as vigorous as the best grown at present, and trees in some of these older orchards were 70 years old and still bearing abundantly when pulled out.

Stone fruit orchards were eliminated mainly on account of the ravages of brown rot, which appeared in the early 1900s and caused havoc among stone fruit crops each year. Because of this many trees were pulled out about 1910 or 1911. Infection in the blossom stage was apparently the worst feature of the disease and it was said that stone fruit would not set even after prolific flowering, the blossoms merely dying and only very poor crops being carried to maturity. At that time the blossom infection was not recognised as being brown rot. Fairly good control of blossom infection has been achieved since and stone fruit is being produced abundantly.

The varieties of apples planted in the first orchards are practically out of existence today, having been replaced by a relatively small number of more acceptable commercial varieties with better appearance and better transport and storage qualities. Here is a list of first plantings: Ribston Pippin, Lemon Pippin, Pear Pippin, Northern Spy, Epps Seedling, London Pippin, May Pippin, Rymer, Corncluster, Brownlee Russet, Nonpareil Russet, and Keswick Codlin.

The early pears consisted of sugar pears and a dry and woody type called locally Dog-choker, a name probably very descriptive of its quality.

Many of the old English plums were grown, including Blue Orleans, Yellowgage, Greengage, Victoria, Magnum Bonum, Damson, and Blue Diamond. Peaches and apricots of unknown varieties, mostly seedlings, were included in most orchards.

Though commercial fruitgrowing in Nelson Province began at Riwaka, it has not developed rapidly in that district during the past 50 years. The suitability of the land there for hops and later the interest in tobacco growing have resulted in land being used for these crops at the expense in some instances of fruitgrowing. The major development of pip fruit growing has taken place on the Moutere Hills, and in stone fruit production in parts of the Waimea Valley.

Later, fruitgrowing received attention from settlers in the Lower Moutere district. J. and D. Drummond planted the first commercial orchards, now owned by Messrs L. Drummond and A. R. Franklin, in 1895, and substantial plantings by Messrs Holdaway followed in 1896. Varieties of apples grown were Blenheim Orange, Spitzenberg, Lord Wolseley, Rymer, Reinette du Canada, Emperor Alexander, Quarrenden, Munro's Favourite (Dunns), and Hoover. Most of these trees were obtained from Australia and some from Hale's nursery in Nelson.

About this time a Mr Farley of Lower Moutere established a pip fruit nursery. Trees raised here provided the nucleus for the Lower Moutere district during the 1913-16 planting boom.

In other parts of Nelson some progress had been made in fruitgrowing, particularly at Stoke and Brightwater, where several small mixed commercial orchards were providing fruit for the Nelson townspeople and also shipping it to Wellington and sometimes to Onehunga for the Auckland market. There were farm orchards from which surplus produce was sold to townsfolk and to a local jam factory, but the first major plantings were those of H. C. Jacka in 1900 (now part of the estate of H. E. Stephens) and A. Gilbert (1907) at Stoke.

With the extensive pip fruit planting on the Moutere Hills and bright export prospects, the wave of enthusiasm extended to Stoke and Riwaka, where a number of new orchards were established from 1912 to 1916.

Trial Export Shipments of Apples

By 1908 fruitgrowing was showing signs of expansion and even with the relatively small acreage of commercial orchards at that time growers were becoming conscious of a need to seek further markets for their fruit, which up to that time was shipped to Wellington and occasionally when opportunity offered to Auckland, but distribution from these centres was limited.

At this period New Zealand was seeking to expand its export trade in

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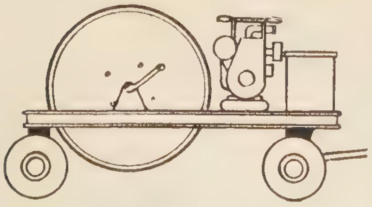

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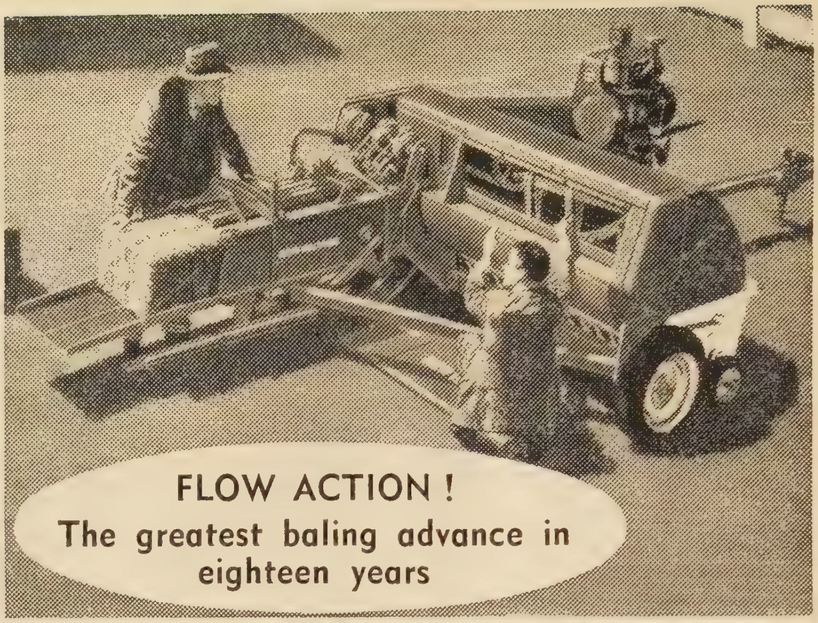

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every way possible. Tasmania was already shipping apples to South America and obtaining satisfactory returns; at the same time there was a promising market in the United Kingdom and Europe. Why could Nelson growers not participate in this trade? E. Buxton and Co. pioneered the first trial shipment to England in 1908, when 1,236 cases of apples were exported under a Government guarantee of 1d. a pound net for fruit. The packing material used was locally made tow from native flax (*Phormium tenax*). The cases were of the Tasmanian or dump type.

F. O. Hamilton of Buxtons, who visited Tasmania in 1908 to gain information on Tasmanian methods, arranged for his firm to import woodwool and apple wrapping paper, the first of these materials brought into New Zealand. Hamilton also brought back the design of a fruit loading tray used in shipping.

In "The New Zealand Journal of Agriculture" of July 1910, T. W. Kirk, Director, Division of Orchards, Gardens, and Apiaries, stated that the building up of an export trade in fresh fruit was of great importance to New Zealand and the establishment of a regular export trade at an early date should be encouraged in every possible way.

Guarantee Renewed

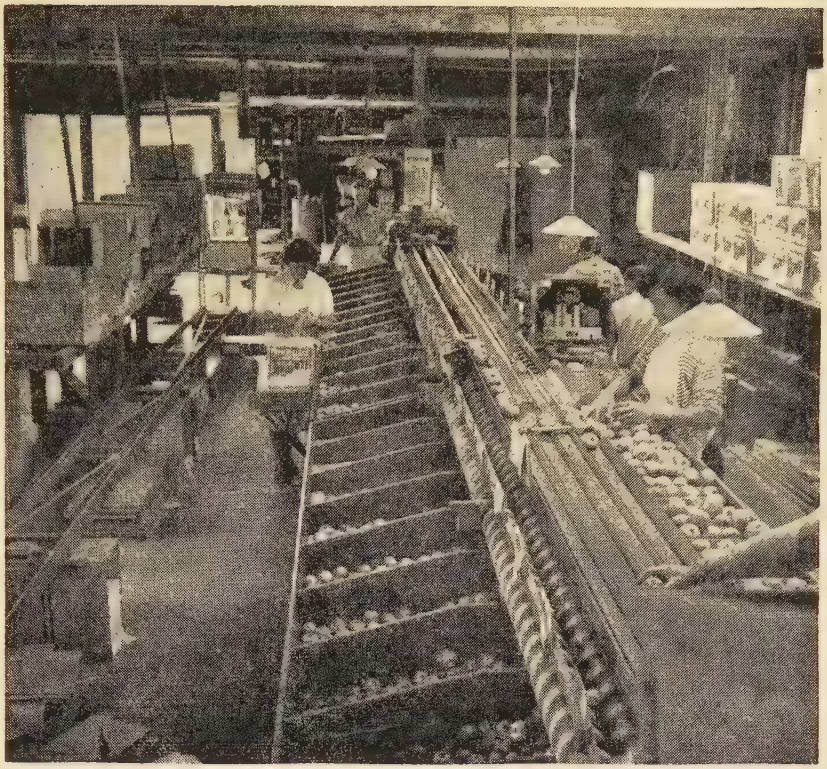
To encourage export of apples the Government in 1910 authorised the renewal of a guarantee of 1d. per pound on all New Zealand apples sold in Europe. Conditions attaching to the guarantee were as follows: "Shipments to be approved by the Departmental officers; to be packed in the Tasmanian or Peacock cases; and shipped in cool storage, the shippers to make their own arrangements for shipping and for sale at destination; the Produce Commissioner in London to examine and report on the shipments".

A shipment of 4,499 cases of apples was made under these conditions from Nelson by the s.s. Paparoa at the end of March 1910. A consignment of 26 half cases of pears was also forwarded.

The shipment was managed by Buxtons, who brought from Australia an expert fruit packer, a Mr Rowlands, to instruct growers in grading and packing for export and to assist in the preparation of the shipment. For the first time Nelson growers saw fruit being wrapped and lined into cases in rows after being sized.

That New Zealand fruit could secure good prices in London was indicated by the satisfactory returns for certain lines. There were faults in packing, temperatures in refrigerated stowage were regarded as too low, and charges were higher than expected, but the results were quite encouraging.

During 1910 T. W. Kirk wrote to prominent fruit brokers in Great Britain and Europe and the British consuls in Buenos Aires, Rio de Janeiro, and Montevideo inquiring about prospects of an apple and pear export trade. Many of the replies gave useful information, and all gave encouragement to a trade being developed.



A well equipped packing shed at Tasman.

In January 1911 the Minister of Agriculture stated that the Government would again guarantee exporters of apples to Europe against loss on terms similar to those of the previous season. The total amount of the Government's liability was not to exceed £315, the amount claimed for the 1910 shipment.

Another Export Shipment

The next shipment under Government guarantee was loaded on to the Rimutaka at Nelson on 6 March 1911. The shipment was a decided advance on that of the previous year in that it was loaded earlier and the prospects of its reaching a relatively bare market were very good. The shipment consisted of 5,500 cases, of which 4,000 were passed by Government inspectors and carried the guarantee, the balance being forwarded at the growers' risk.

Buxtons had shipped 757 cases of apples and 20 cases of pears to Montevideo in 1910, and on 23 March 1911 a further shipment of 310 cases of first-grade, well packed apples was made to the same market. This fruit was carried as ordinary cargo and both shipments were a success.

The Government renewed the guarantee against loss on shipments of apples in the 1912 season, increasing the maximum sum payable to £415.

This encouragement from the Government had a very important influence on the expansion of apple growing in Nelson and the development of the Moutere Hills orchard lands, which at that time were receiving much attention from people interested in land development. This brought a good response from growers, so a third endeavour to test on a commercial scale the British apple market was made in March 1912, when 5,493 cases of Nelson apples and 11 cases of pears were shipped on the Kaipara. Of the apples, 5,411 cases were eligible for the guarantee.

Motueka district growers provided 4,629 cases and Nelson growers (mainly Stoke) 864 cases. Before and during packing, demonstrations were given by two officers of the Department of Agriculture, J. H. Thorp and

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G. Stratford, Thorp having recently come from Tasmania to join the Department as an instructor and Stratford from British Columbia.

A large part of the shipment was packed by Rowlands, the Tasmanian packer brought to Nelson by Buxtons.

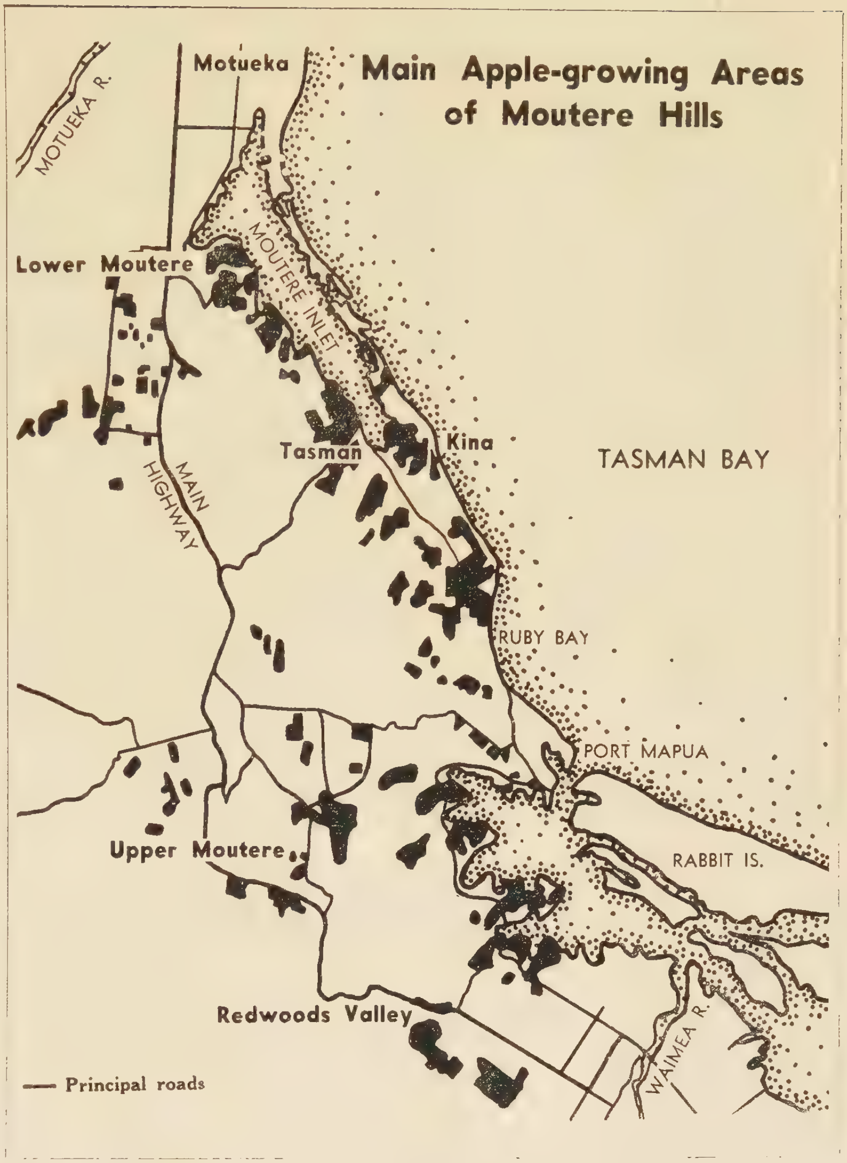
Varieties were Jonathan, Dunns, London Pippin, Alfriston, Sturmer, Cox's Orange, Cleopatra, Reinette du Canada, Lord Wolseley, and small quantities of some 16 others. This trial shipment consisted largely of the most popular export varieties today (Jonathan, Cox's Orange, and Sturmer).

The apples were landed in good condition, but prices were rather low because a coal strike and earlier dislocation of transport caused an accumulation of Australian apples, which were not all sold, and more shipments were due.

Extension in Planting; a New Era Begins

The successful export shipments and Government guarantees gave fresh impetus to planting for the production of export fruit in Nelson and other fruitgrowing districts. "The New Zealand Journal of Agriculture" of February 1912 noted that orchard areas in New Zealand had increased by over 5,000 acres in the 3 years 1909 to 1911 and that Nelson had contributed 1,300 acres.

The increase in Nelson Province would have been accounted for by the expansion on the Moutere Hills just being opened up for settlement by orchardists and the beginning of a new era in fruitgrowing in areas nearer Nelson. Though several commercial orchards of then recognised exportable varieties had been planted at Stoke, most orchards in the province were of mixed varieties, many of which were unsuitable for shipping. A. Gilbert had planted an orchard at Stoke on modern lines in 1907 and H. C. Jacka, previously of Riwaka, had extended a 2-acre orchard to 10 acres about 1900. This orchard is now part of that of Mr E. Stephens.


Main Apple-growing Areas of Moutere Hills

Moutere Hills Development

After F. O. Hamilton's visit to Tasmania in 1908 Frank Walker, a prominent Tasmanian orchardist and nurseryman, visited the Nelson district on Hamilton's suggestion. He gave valuable advice to growers on locations for orchards and best varieties of apples and pears for export.

Both Walker and Hamilton after his trip to Tasmania were impressed with the possibilities of the block of land now known as Tasman for producing high-quality fruit for export. The prospects were discussed at a meeting in the home of A. McKee, who later established the well known orchard at Tasman, originally of 100 acres.

Later McKee took options over properties at Tasman and formed the first land syndicate interested in the subdivision of Moutere Hills land for fruitgrowing and settlement. He subdivided a 300-acre block at Upper Tasman, previously Nutalls, retaining an area where he established a variety-testing area of 1 acre. This became a centre for demonstrations and discussions for some time and assisted the new orchardists to obtain a knowledge of varieties and to choose what to plant.

In 1911 McKee floated a company known as the Tasman Fruit Lands Ltd. It acquired 2,000 acres purchased from a Mr Brown and the residue of McKee's first subdivision at Upper Tasman. The first extensive planting in this area was in 1911, but rapid progress was made in the Tasman district between 1912 and 1916.

There followed closely a number of large subdivisions in the coastal strip of the Moutere Hills extending from Mariri to Appleby and running back to the main highway through the Moutere Valley, and at Upper Moutere and Redwoods Valley. The major subdivisions included Bronte, Mahana (Bell Estate), Stewart Estate, Tasman West (Harakeke), Tasman North, and Broadlands. A number of smaller subdivisions were also made.

The Mildura Orchard block at Upper Moutere of 300 acres was developed at the same time, the intention being to subdivide and dispose of bearing orchards. Tasman Fruit Lands Ltd. formulated a plan for settlement which became the general pattern for all other syndicates. They undertook to

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supervise the clearing, planting, and maintenance of orchards for absentee owners for 5 years and to employ an experienced orchard supervisor for that purpose. F. E. Nottage, an Orchard Instructor in the Department of Agriculture, resigned from his position to become the agent and orchard supervisor for the Tasman syndicate.

He developed an orchard of his own at Tasman, where he resided until 1955 and was actively engaged in fruitgrowing.

The pattern for development was sound, as it made possible the establishment and maintenance of young orchards by persons who could carry on their normal business in other centres and supply needed capital, and also assisted others with limited resources who had settled on their holdings to secure a livelihood during the lean years of development by undertaking the pioneering work of clearing, planting, and orchard maintenance for absentees.

Some prominent horticulturists and professional men and businessmen took up blocks in Tasman. Among these were T. W. Kirk, then Director of the Orchards, Gardens, and Apiaries Division of the Department of Agriculture, Thomas Horton, prominent Hastings nurseryman, Mr Justice Chapman, E. H. Williams, Hastings solicitor, H. R. Duncan and Dee Bros., Nelson, and T. L. Austin and C. H. Tucker, both well known Dunedin businessmen. The four last names are still associated with fruitgrowing in Nelson.

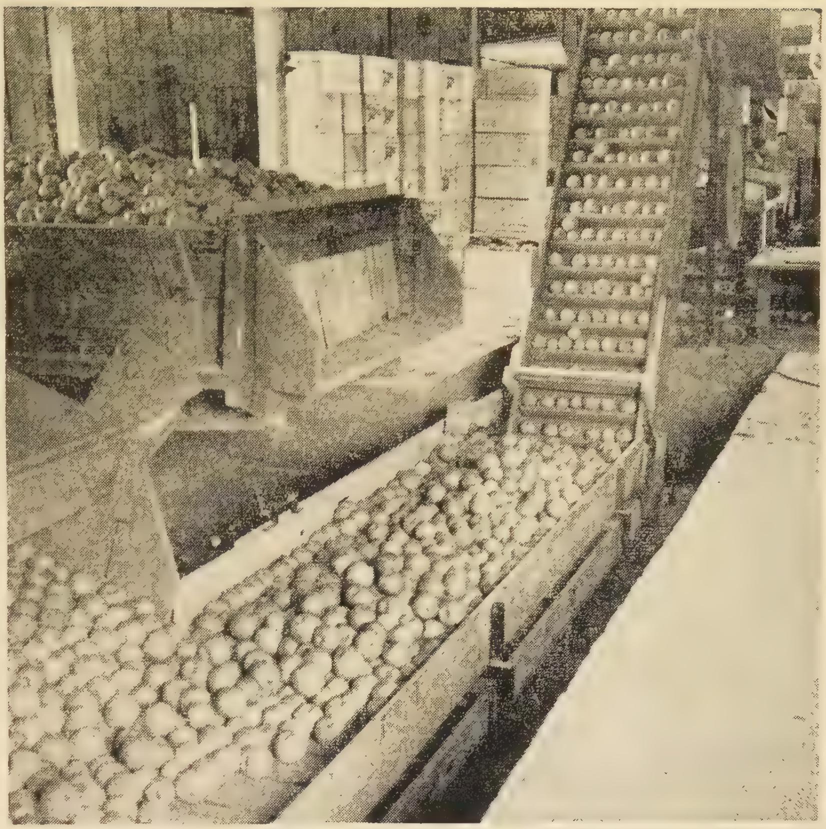
Second Lot of Pioneers

Those who settled on their holdings and engaged in orchard development were pioneers in every respect. From Mariri to Redwoods Valley by what is now known as the coastal route and the whole of the coastal strip were unroaded and very sparsely settled with not more than five homesteads. The area was mainly scrub covered, but it provided some scanty grazing for sheep in parts, with a few small flats grassed. It was uninviting country which could be described as marginal land.

Some of the early arrivals in the area lived in tents until they could provide more adequate shelter. Communication with Nelson and Motueka was difficult, but employment was plentiful and people entered into their new life with great enthusiasm, though residents in the more settled areas of Nelson predicted failure and financial ruin for those "poor misguided settlers".

Clearing, roading, and planting went on apace between 1911 and 1916, but by 1916 the effects of the First World War were being felt. Young men had left for overseas service and the future looked uncertain; consequently planting came to a halt.

During the boom years upward of 7,000 acres were planted in fruit trees. With such extensive planting, especially by people inexperienced in fruitgrowing and its requirements, much indiscriminate planting was unavoidable and a percentage was doomed to failure. The cost of development and time taken for orchards to come to maturity were miscalculated. This led to many people becoming discouraged or short of funds and finally having to abandon their holdings. For a number of years, therefore, abandoned orchards were not uncommon.



Bulk-harvesting trailers (left) delivering apples into a packing shed.

However, there merged from it all a flourishing industry which has stabilised at about 2,500 acres of apples and pears located on Moutere Hills and another 1,050 acres of orchard, including stone fruits, on the flats of Riwaka, Moutere, Stoke, and parts of the Waimea Valley.

Breaking in of the country was very laborious compared with present methods and less effective. Scrub was cut by hand and burnt and the land broken up by horse-drawn single-furrow ploughs of the short-mouldboard type. For cultivation relatively light horse-drawn implements were used. No time was allowed for fallowing, and on such a raw clay soil insufficiently prepared for planting growth response was poor.

In recent years heavy scrub has been bulldozed, burnt over roughly, and ploughed deeply with a tractor-drawn swamp plough, or broken up with giant discs and given sufficient time to fallow. With heavy implements and the use of tractors this same land can be given good preparation for planting, which is reflected in tree growth.

Fruit Export

The Moutere Hills orchards had been planted mainly to produce fruit for export. Growers were not well placed geographically for individual distribution of their produce within New Zealand, so naturally concentrated on developing, with Government backing, an export trade.

After the First World War Nelson was becoming vitally interested in fruit export, as it was expected that orchards planted between 1911 and 1916 would attain maturity between 1924 and 1930. Trial shipments before the war encouraged early arrangement of resumption of exports and in 1920 about 34,000 cases of Nelson fruit were sent to London.

Government Guarantee on Export Fruit

Up to and including 1926 the Government continued its export guarantee of 1d. per pound net for fruit to

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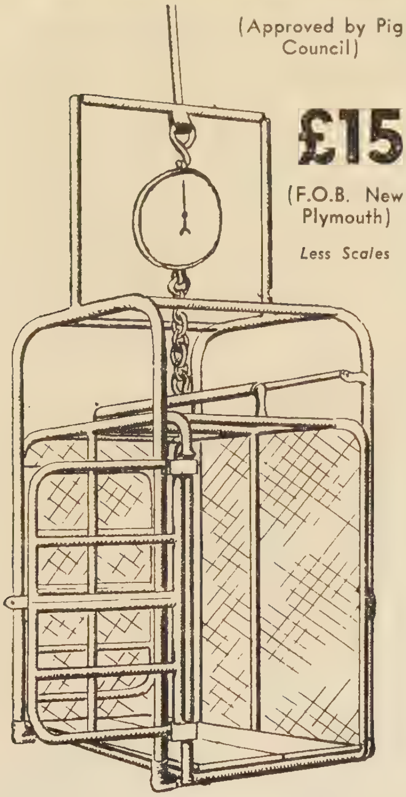

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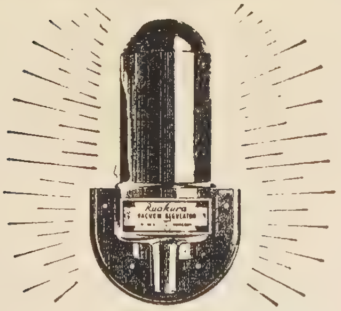

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Loading export apples at Port Nelson.

the grower. However, after a very heavy payment on the 1926 crop due to losses arising through a general strike in Britain the guarantee was amended to cover only the cost of preparing and transporting fruit from orchard to overseas markets.

Even under the adjusted guarantee export increased, and though other districts in New Zealand came into the picture at this time, Nelson continued to contribute the larger portion of export fruit shipments.

The New Zealand Fruit Export Control Board took control of export in the 1926 season and retained it until the outbreak of war in 1939, when further export of fruit looked impracticable. The Government then accepted responsibility for marketing New Zealand grown apples and pears.

Because the Nelson district was producing principally for export, fruitgrowers there were not as seriously affected by the economic depression of the 1930s as were fruitgrowers in areas which depended more on local markets.

Pre-war Exports

From 1927 to 1939 Nelson contributed 9,020,090 cases of apples out of a total of 14,638,071 exported and 438,069 cases of pears out of 1,083,853 exported. The peak year was 1934, when more than 1 million cases of apples and pears were exported from Nelson. The South American trade, resumed in 1922, reached its peak in 1929 and 1930 with these markets absorbing over 150,000 cases. After 1930 this trade declined steadily as the countries' own production increased. A market in Canada was developing, however, to compensate for this loss and Europe was absorbing substantial quantities, the 1939 shipment exceeding 200,000 cases.

During these years substantial progress had been made and growers were reaping their reward for many years of effort and privations. Orchards were becoming better equipped, homes were being improved, and prospects seemed brighter. The outbreak of war in 1939 changed the whole outlook. New Zealand could not absorb the whole of the local apple and pear production at economic prices, and the question was could Nelson orchards, the worst placed for local distribution, survive?

A marketing scheme involving at first straight-out Government purchase but later giving place to the functioning of a Fruit Marketing Council assisted by Government subsidy enabled Nelson orchards to carry on. However, during the war, production declined owing to shortages of labour, equipment, and fertilisers.

Because of rising costs and marketing difficulties, there being no export except of fruit sold to the United States Joint Purchasing Board for troops in the Pacific, the subsidy was considered inadequate to enable payments to growers high enough to meet production costs. In 1947 a cost survey for pip fruits was made and standards derived from it were accepted by the Government and adopted in regulations made under the Apple and Pear Marketing Act 1948. The New Zealand Apple and Pear Marketing Board, established under this Act, has been responsible for the marketing of the whole of the apple and pear crop since the 1949 season. Cost adjustments are made each year and an average overall price based on costs is paid.

All this has had a very important bearing on the progress of pip fruit growing in Nelson. Stability has been achieved and settlement of ex-servicemen on orchards has been acceptable to rehabilitation authorities. This led to great progress in apple growing areas after 1946, reaching a peak in the 1951 season.

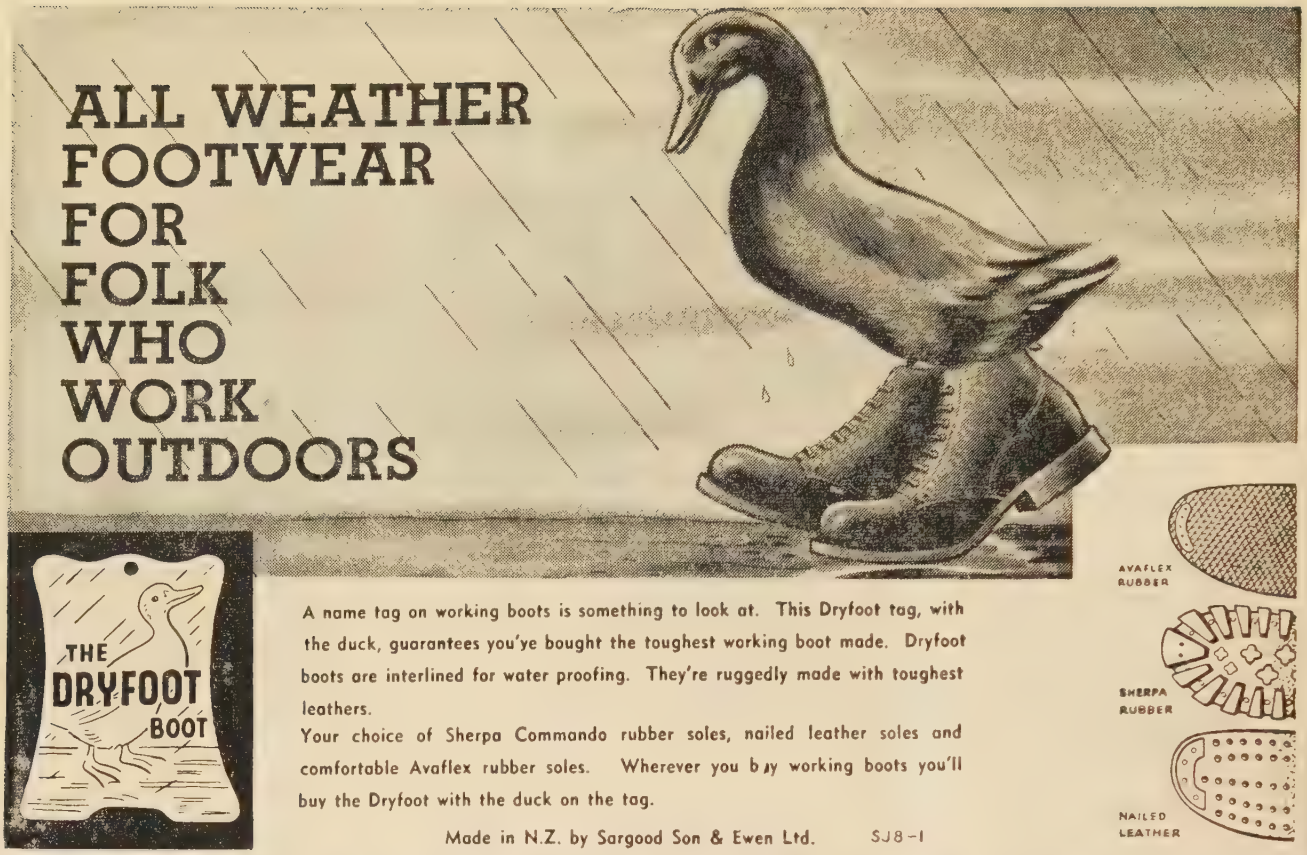
Fruit export resumed in 1948, though a small export to the United Kingdom had been made in 1946. In the 1950 season there was a resumption of full-scale export, when Nelson contributed 676,000 cases, but all this fruit was transhipped in Wellington, a severe handicap. Since then part of the export fruit has been shipped direct from Port Nelson each year, but not to the extent necessary to achieve the best results. Direct shipments and total export figures for Nelson from 1950 to 1956 are:

	Total export cases	**Direct loadings** cases
1950	676,000	—
1951	580,000	404,000
1952	795,000	485,000
1953	881,000	441,000
1954	767,000	294,000
1955	856,000	288,000
1956	955,000	455,000

There was a great advance in fruit handling in the 1950 season with the introduction of pallets on which the cases are stacked and then moved by fork-lift trucks, thus eliminating practically all handling of individual cases after they leave the orchards until they are stored in ships' holds.

Production has been influenced not only by the better economic position of the industry but by better management resulting from experience and research, which has largely been responsible for increased yield and improved growth of trees. Though many orchards are over 45 years old and some trees show deterioration, production from others is building up. Replacement of worn-out trees by others on more vigorous stocks, such as Malling XII and selected seedling stocks, has been successful, and by judicious replanting the economic life of Moutere Hills orchards and others in the district should be extended for many years.

(To be continued.)



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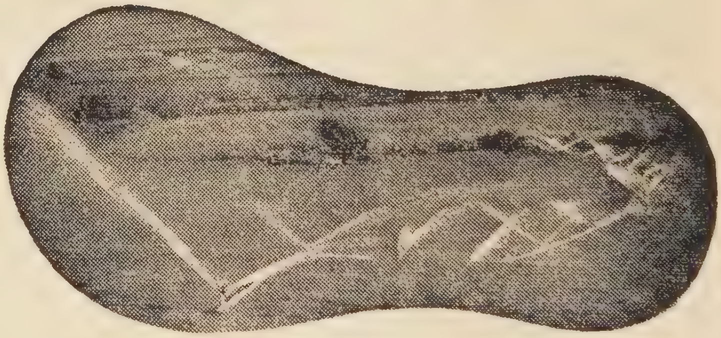

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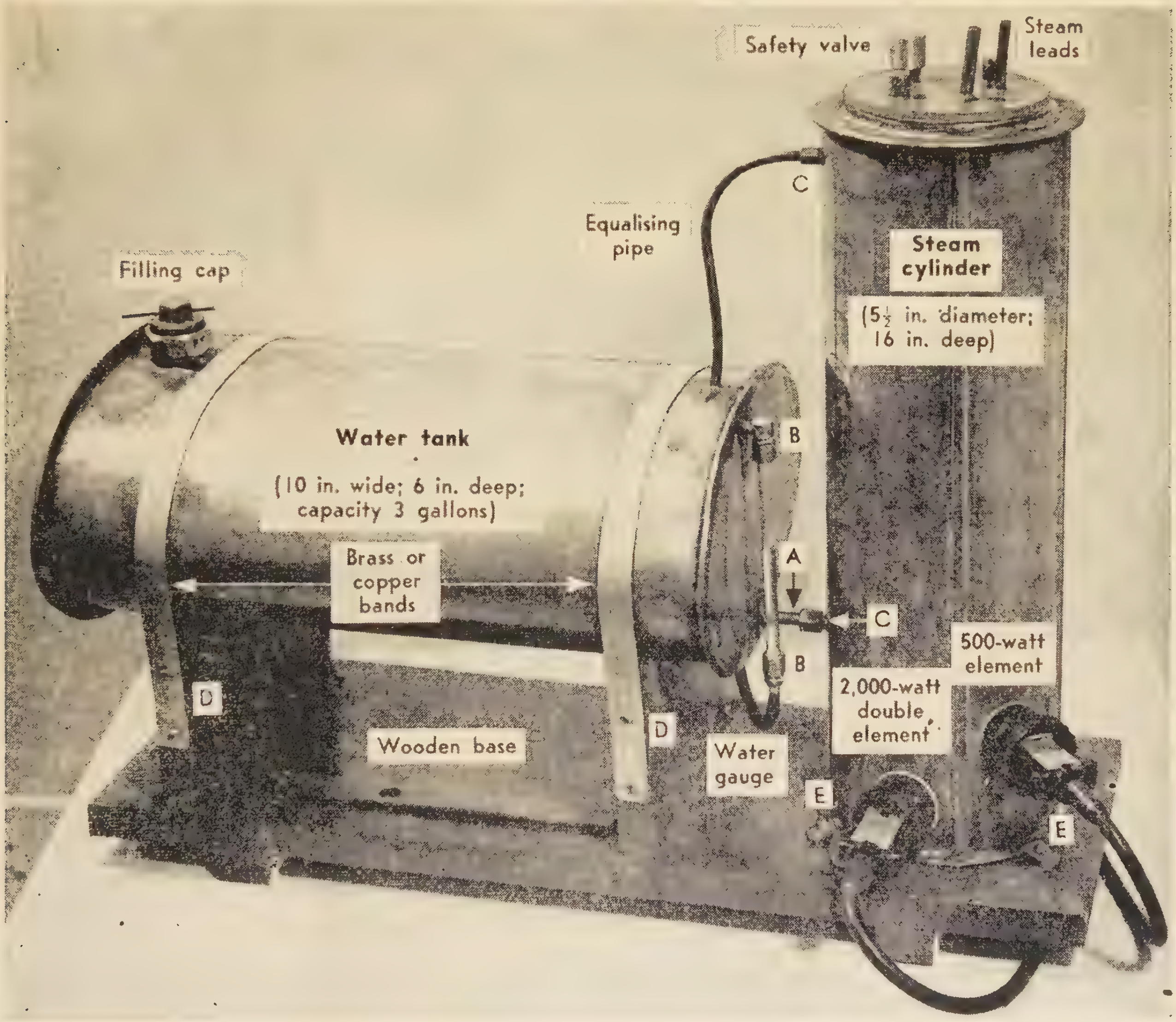
A New-type Electric Steam Generator for Honeycomb Uncapping Knife

By C. R. PATERSON,
Apiculturist,
Department of Agriculture,
Hamilton

BEEKEEPERS who do not possess a steam boiler have to rely on a small electric boiler to generate sufficient steam to heat the uncapping knife during extraction. This article describes a simple electric steam generator which will run for hours without needing to be stopped and refilled with water. Many of this type are in use around the Waikato, and beekeepers using them find they can get steam in 5 to 6 minutes and never have to stop to replenish the water supply.


Safety valve
Steam leads
C
Equalising pipe
Steam cylinder
(5½ in. diameter; 16 in. deep)
Filling cap
Water tank
(10 in. wide; 6 in. deep; capacity 3 gallons)
B
Brass or copper bands
A
C
B
500-watt element
2,000-watt double element
D
D
Wooden base
Water gauge
E
E

The complete steam generator. Parts not named in the illustration and referred to in the article are as follows: A—Water supply pipe. B and C—Fittings. D—Wooden supports shaped to hold water tank. E—Brass clamps to hold cylinder on to base.

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. . . STEAM GENERATOR FOR HONEY UNCAPPING KNIFE

DURING extraction time some form of knife is required to remove the wax cappings from the combs of honey before they are whirled around in the honey extractor. In the early days of commercial beekeeping in New Zealand many beekeepers used what was called a cold knife. This was a long, thin blade with a very keen edge. As considerable experience was required in the use of this type of knife, many resorted to the stiffer blade that was kept warm by dipping it into a can of hot water. It was not long before this method was superseded by use of what is generally known as a steam-heated knife. This was kept constantly hot by steam from a small boiler heated by a primus stove.

With the electrification of most honey houses beekeepers soon changed over to electric steam generators, the type now generally in use. However, some inconvenience has always been associated with their use. If one is made to generate steam quickly, frequent stops are needed to replenish the water supply. A larger unit giving a greater supply of water always takes too long to generate steam.

The steam generator which is described in this article gives a quick supply of steam and will not need to be refilled for 3 to 4 hours.

Description

This steam generating unit can be divided into two main components.

1. A water supply tank made of heavy gauge copper and shaped to give maximum internal strength. It is fitted with a water gauge for indicating water level, and a coarse strainer is fitted inside the filling cap to prevent rubbish getting into the tank and perhaps causing a blockage at the outlet. A wasp has been known to enter the tank when it was being filled with water, with the result that the elements burnt out. The strainer is to prevent such things happening.

2. The steam generator cylinder is also made of heavy copper and has a screw top big enough to allow elements to be replaced. When this system of steam generation was first tried about 10 years ago the cylinder was not high enough to prevent boiling water going out with the steam. With greater height this does not occur and there is more space for a build-up of steam. In the metal cap are one or two tubes for connecting the rubber tubing from the uncapping knife. A safety valve is also fitted as a precaution against accident. As this steam generator is not a completely closed unit, it is not classified as a steam boiler. The steam knife is also an open unit, as the steam in passing through gives it the required heat. However, a pinched rubber tube could readily bring the safety valve into action.

Two electric jug elements are used. The top one can be turned off if sufficient steam is being generated.

The water tank and the steam cylinder are joined together by two copper tubes. The lower one is placed to deliver water always above the top element. This tube must be of a size to allow a sufficient flow of water to replace steam generated. The smaller tube which comes out near the top allows equalisation of pressure and will eventually warm up the water in the water tank.

Though it might be considered desirable to have the water gauge on the steam cylinder, experience has shown this is not best, because the gauge glass very soon clouds up and makes it very difficult to see the water level. The illustration on page 83 shows the complete unit.

Construction

The construction of the two main components, the water tank and the steam cylinder, should be handed over to someone skilled in sheet metal work, as these require to be well made and the seams on the steam cylinder silver soldered.

The Water Tank

The body of the water tank is made of a piece of 20-gauge sheet copper 17½ in. x 27 in. and shaped as shown in the illustration. This will give maximum strength and still allow the water supply to be at the correct levels.

Two pieces of 7 in. x 11 in. 18-gauge copper are used for the ends.

A brass fitting with a 1 in. plug can be used as a filling cap. Inside the cap is a cylindrical brass gauze strainer about 2 in. long.

The water supply pipe is a piece of 5/16 in. copper tubing about 1½ in. long (A in illustration). One end is fitted with a brass union for connecting to the boiler. The water gauge is made of ¼ in. copper tubing and brass petrol pipe fittings. These fittings (indicated by B) when unscrewed allow the gauge glass to be replaced. A good method to use when soldering this component into the supply tank is to place a piece of wooden dowel or round metal in place of the gauge glass. Screw up the two nuts and everything will be held firmly in place during soldering. Once the soldering is done the stick can be removed and the glass tube put into position without any risk of its breaking as soon as the nuts are screwed up. Suitable packing for the gauge tube can be made from a length of rubber tubing of the correct size by slicing off two thin pieces with a very sharp knife.

The Steam Cylinder

The steam cylinder is made from a piece of 20-gauge sheet copper 16½ in. x 18 in.

Two pieces of 18-gauge 6½ in. x 6½ in. copper are used for the top and bottom. The top screw cap is made from a 4 in. brass inspection trap, procurable from any plumbing firm. Before this is brazed into position about 3 in. of the body of the trap is sawn off, as it is not required.

Two holes 1 5/16 in. in diameter are cut in the lower part of the cylinder for the two jug elements. A double X 2,000-watt element is placed in the bottom hole and a 500-watt element in the top hole. This top element can be disconnected when too much steam is being generated. The fittings C are now brazed into position.

The Wooden Base

The wooden base is made of a piece of ⅞ in. dressed timber 8 in. x 26½ in. Two short pieces of timber are screwed on underneath the base.

Two pieces of shaped wood (D) are required to support the water tank, but before these can be cut to size the steam cylinder should be placed in position and screwed down by four brass clamps (E indicates two of these clamps).

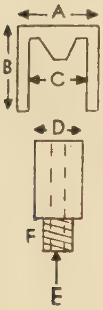
The top edges of the wooden supports are cut away to coincide with the curve of the water tank. The opposite edges are then trimmed off on the saw until the water tank connects correctly to the steam cylinder.

The water tank is held in position by two bands of brass or copper ¾ in. wide by 26 in. long which are screwed on to the wooden supports.

The equalising pipe, made of copper tubing of 3/16 in. inside diameter, can now be soldered into position.

Two steam leads will have to be brazed into the screw cap on the steam cylinder as shown in the illustration. One goes to the uncapping knife and the other to a hot tray. To prevent accidents a safety valve is fitted. This is made of a stem of square brass and and a brass cap which slides neatly

UNCAPPING HONEY . . .



Safety valve for the steam cylinder. Measurements are indicated as follows: A—⅞ in. B—1 in. C—⅝ in. D—9/16 in. E—3/16 in. hole. F—Screwed for ⅜ in.

over the top as shown in the drawing above.

To complete the unit two electric leads with 3-pin plugs are required.

Another set-up which has been used by several beekeepers is to connect the water supply tank to the water supply and control the level by a ball cock and float. The float should be of metal. If the pressure from the mains is too great, it can be controlled by a reducing valve similar to that used in hot water systems which are directly connected to water mains.

A piece of metal 1 in. x ⅛ in. x 8 in., with holes placed to fit over the two protruding lugs on the cap of the steam cylinder, is useful as a lever for unscrewing the cap.

Operating Instructions

Fill the supply tank with water and wait for a few minutes until a similar level has been reached in the steam cylinder.

Switch on both elements, and in about 6 minutes steam should be coming out the top tubes. As the water in the supply tank slowly warms the efficiency of the unit will increase until it may be found that the 500-watt or top element can be switched off.

The water gauge should be watched and the water level should not be allowed to fall below the danger mark, which is about ½ in. above the top element.

A unit of this type made of copper should last a lifetime. As earlier types made of galvanised iron had a very short life, it is unwise to try to economise in this respect.

The material cost of the unit shown in the illustration was:

	£	s.	d.
Copper for tank and cylinder made up . .	10	0	0
Screw cap	1	5	0
Elements	1	13	6
Electric leads	1	5	0
Fittings	2	15	0
Base		5	0
Total	17	3	6

Book Reviews

"The Rabbit Problem in New Zealand": Walter E. Howard

THIS very readable 48 page illustrated bulletin (No 16 in the Department of Scientific and Industrial Research information series) deals very briefly with the past, fully with the present, and speculatively with the future of rabbit control in New Zealand.

The author is an animal ecologist from the University of California who spent 10 months in New Zealand attached to the Animal Ecology Section of the Department of Scientific and Industrial Research. His training and experience in animal ecology have enabled him to present a reasonable and logical approach to both the incidence and control of rabbits.

Need for More Research

Though a considerable amount of research has been done on the life, history, and habits of the rabbit in New Zealand, the author points to the need for additional research to determine such matters as its social structure, bait-shyness in relation to sublethal doses of poison, and the factors responsible for the presumed high juvenile mortality in tall grass, all of which have a close bearing on continued control.

In discussing predators he says: "Rabbits are more likely to determine the density of predators than predators are likely to govern the density of rabbits".

The author lays considerable emphasis on the importance of habitat in relation to population densities and one is left with the thought that just as rabbits exert a large measure of control in vegetation, so does vegetation, if given the chance, have a considerable effect on the control of rabbits. He points out that aerial seeding and topdressing have, besides improving the grassland, created conditions which are less suitable for the rabbit.

Affected by Land Use

Using as examples experiences with rodents in America, the author emphasises that rabbit populations are regulated very largely by the pattern of land use, and that land abuse is often a secondary cause of variations in populations.

As a corollary to this he later states: "Half the problem of rabbit control in the high country is to establish grass on the bare spaces so that they will no longer be attractive to rabbits." He is, however, careful to draw attention to the fact that a change to weather less favourable than that during the last 2 years could well improve the habitat conditions for rabbits.

On the subject of control Dr Howard is satisfied that "No other country has its rabbit destruction programme so well organised". He thinks, too, that "New Zealand is fortunate that myxomatosis was not successful".

A considerable amount of space is devoted to various baits and attractants and special mention is made of the possibilities of developing persistent baits.

This bulletin deserves to be widely read not only by those interested in rabbit control, but by those interested in the relationships between plants and animals.

—*S.H.S.*

Government Printer, Wellington. 4s.

"Pig Carcass Evaluation": G. Harrington

THIS publication is a review of the techniques which have been used in the assessment of carcass quality in circumstances ranging from scientific investigations to commercial grading.

The field is covered adequately and expertly, and the extensive bibliography will be extremely useful both to students and those working on meat research.

The reader must agree with the author's conclusions that present methods of carcass evaluation, in many cases, have only an indirect relationship with commercial values and that consumer preference surveys are essential if measurement and appraisal systems used to determine quality and price to the producer are to be put on a truly objective basis.

—*D.M.S.*

The Commonwealth Agricultural Bureaux, Farnham Royal, Bucks, England. 15s.

It is often difficult to cope with an abundance of cucumbers from the home garden. Here are some ways of

Using Cucumbers

By CHRISTINE LYONS,
formerly Home Science
Instructor,
Department of Agriculture,
Auckland

IN many households cucumbers are seldom used for anything but salads and sandwiches, though they can be served in a variety of ways, both cooked and raw. Cucumber makes attractive garnishes for summer meals and for wine cups. It is an excellent accompaniment for certain fish dishes and it makes pleasant-flavoured chutneys. When cooked it has a bland flavour somewhat similar to marrow and can be eaten as a vegetable or used as a base for savoury dishes.

ONE of the main attractions of the cucumber is its pleasant cooling flavour. It has, however, no appreciable food value and when eaten raw it is not always easily digested by many people who enjoy its flavour. Provided the cucumber is fresh it will be digested better if the peel is left on and the slices are not cut too thinly.

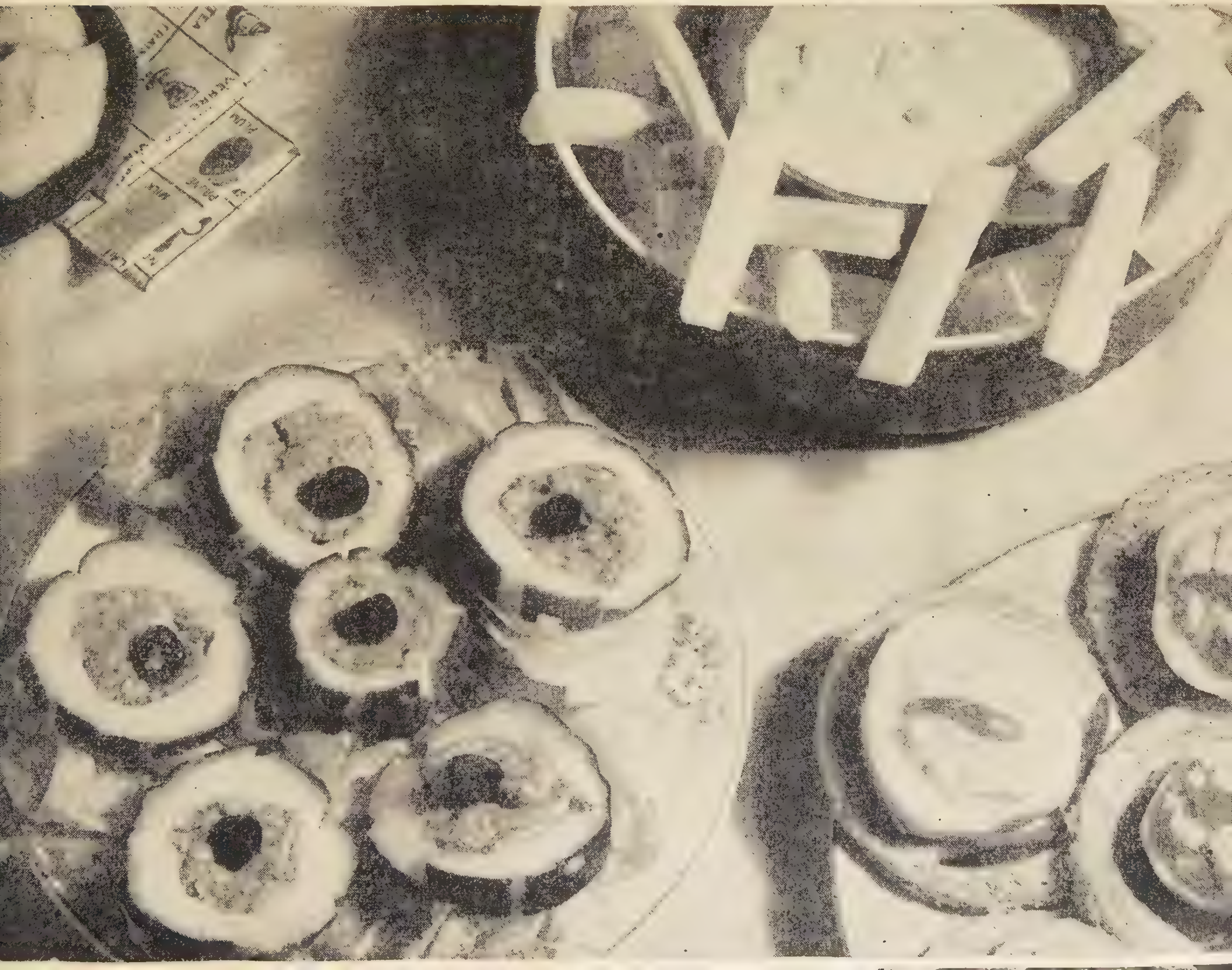
Cucumbers in good condition for use are firm and smooth. Those that feel soft and flabby have in all probability been picked when immature and those that are starting to turn yellow may have been left too long on the vines.

Provided they have been picked in the correct condition, cucumbers will keep for 10 to 14 days at a temperature of 45 to 50 degrees F. and at a humidity of 85 per cent. Storing in wax paper will help retain the humidity and the vegetable crisper of a refrigerator should have a temperature of approximately 45 to 50 degrees. If the temperature is too cold (below 45 degrees), dark watery patches will appear and these will soon become infected with mould. On the other hand, if the temperature is above 50 degrees, the skin will tend to change from green to yellow.

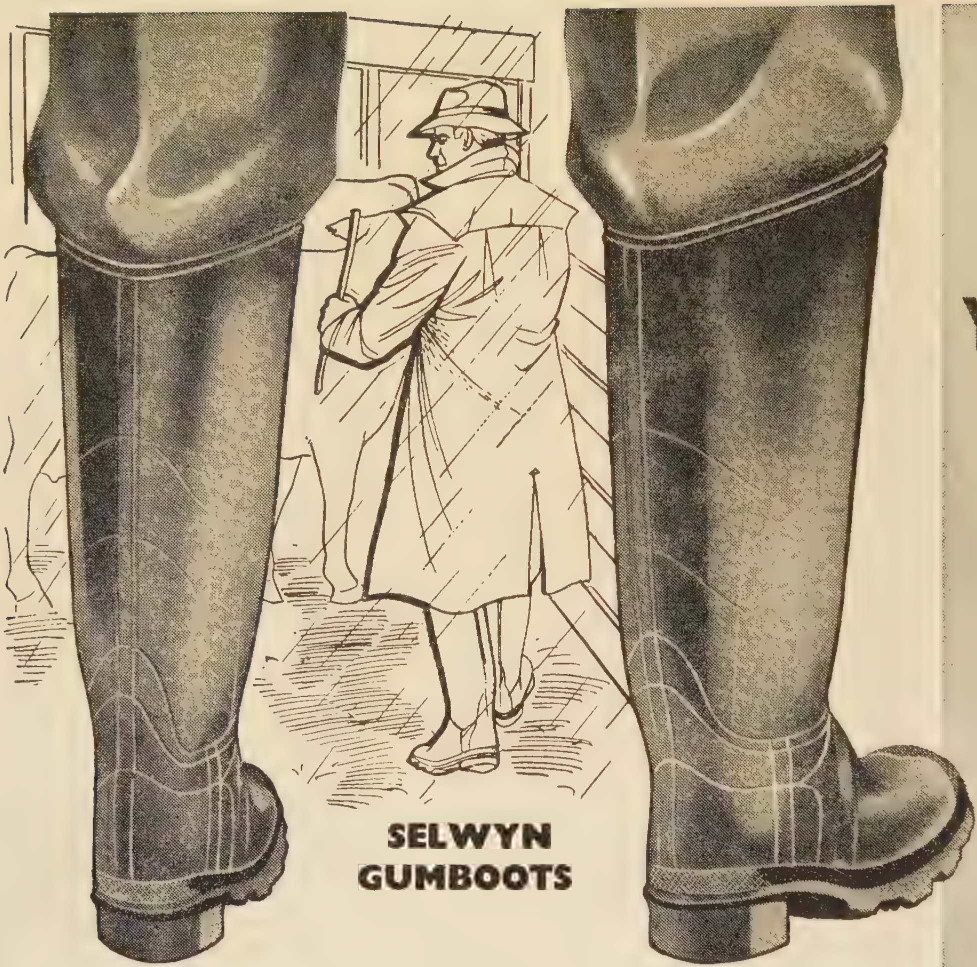
Recipes

Cucumber Salad

Cucumbers should not be sliced and left soaking in vinegar for long, as the slices will become limp and unappetising. As near to serving time



▼ Party savouries. From left to right—Salmon - stuffed cucumber, cucumber dip, cucumber cheese rings.



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BY SKELLERUP

GUMBOOTS

Baked stuffed cucumber.

as possible slice the cucumber, retaining the peel if it is freshly picked. Sprinkle with salt and pepper, toss with French dressing, and sprinkle with chopped chives.

Savoury Slices

Take a large cucumber, wipe the skin, then cut crosswise in halves. Scoop out the seeds and fill the centre with the following mixture:

½ cup of mashed salmon
1 to 2 tablespoons of salad dressing
⅛ teaspoon of paprika
1 teaspoon of chopped parsley

Pack this mixture firmly into the cucumber, wrap in waxed paper, and leave in the lower part of a refrigerator for several hours. Just before serving cut in slices about ¾ in. thick and serve on lettuce leaves or on rings of buttered brown bread. A cheese filling can be used in place of salmon.

Cucumber Dip

This is an unusual and refreshing party savoury. Take two peeled cucumbers, remove the seed portions, and cut into pencil-thin strips about 2½ in. long. Crisp these in a bowl of iced water for 1 to 2 hours.

Dip

4 oz. of whipped cream
2 teaspoons of horse-radish sauce
1 tablespoon of vinegar
1 teaspoon of chopped chives
1 teaspoon of chopped parsley
¼ teaspoon of paprika
½ clove of crushed garlic
Salt and pepper to taste

Combine all the ingredients and chill in a refrigerator for about 1 hour. When ready to serve put the dip in a small bowl, place this inside a larger bowl, put ice cubes in the larger bowl, and place the cucumber strips on top of the ice (see illustration on page 87).

Cucumber Chutney for Curry

Curries are sometimes served with a selection of chutneys as accompaniments. The following one, made with fresh cucumber is a very good addition.

Half a small onion, finely grated
Half a cucumber
2 teaspoons vinegar
1 teaspoon of sugar
Chopped parsley

Mince or grate finely the onion and the cucumber, mix with the vinegar and sugar, put into a small dish, and sprinkle with chopped parsley.

Cucumber Relish

1 lb. of apples (peeled weight)
1 lb. of onions
1½ lb. of cucumber (unpeeled weight)
1 lb. of sugar
1 teaspoon of pepper
1 dessertspoon of curry powder
1 pint of vinegar
1 oz. of salt

Mince the apples and cook in vinegar. When soft, add the sugar, onions (minced), pepper and salt, and curry powder. Cook this until soft, add the cucumber (minced), and boil for 5 to 10 minutes. Put into bottles immediately.

Cucumber Pickle

Cucumbers can be pickled by the dry-brining method. This is the most suitable method for watery vegetables.

Cut them into quarters lengthwise and then into ½ in. slices. Place the pieces in a deep bowl, sprinkling salt between the layers in the proportion of ½ tablespoon to a pound of vegetables, cover the bowl, and leave overnight. Drain, pack into jars, and cover with cold, spiced vinegar. If metal covers are being used for the jars,

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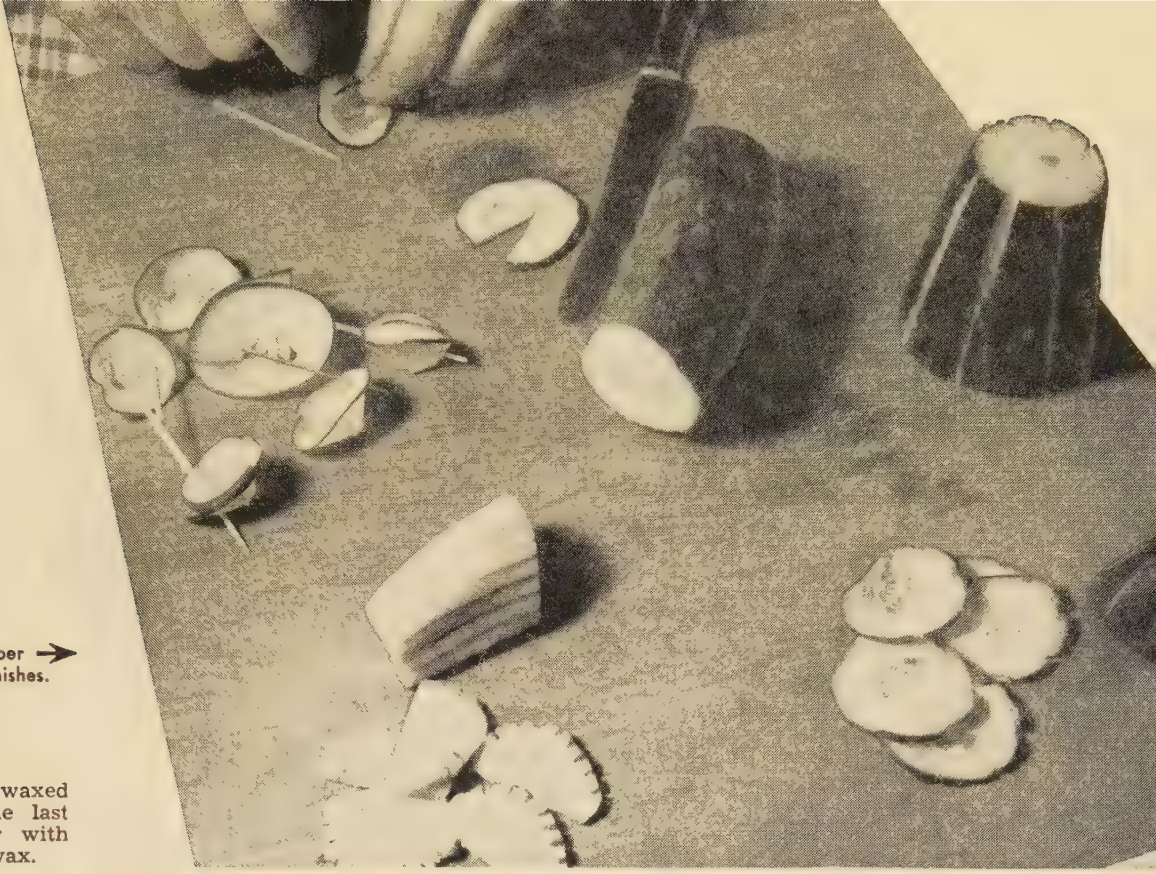
Cucumber → garnishes.



line them with waxed paper or fill the last inch of the jar with melted paraffin wax.

Stuffed Cucumber

2 medium-sized cucumbers
Bacon strips (fatty)
½ cup of thick white sauce
1 small onion (minced)
1 cup of flaked cooked fish
Salt and pepper
3 tablespoons of chopped uncooked celery
1 tablespoon of chopped parsley
½ teaspoon of mixed herbs
2 hard-boiled eggs (chopped)

(4 servings)

Peel the cucumbers and cut in halves crosswise and then again lengthwise, remove the seeds, and boil the pieces for 10 minutes. Combine the sauce, onion, fish, celery, parsley, herbs, eggs, and salt and pepper. Fill the pieces of cucumber with this mixture, place the strips of fatty bacon on a baking dish with the filled cucumber on top, and bake in a hot oven (400 degrees F.) for ½ hour or until tender. Garnish with small tomato halves if available.

Cucumber Cheese

2 cucumbers
4 medium tomatoes or ½ cup of tomato puree
¼ cup of cream
1 cup of grated cheese
Parsley
Mint
Pepper

(4 servings)

Peel and cut the cucumbers into strips about 2 in. long, boil in salted water for 15 minutes, drain well, and place in an ovenproof dish. Cook the tomatoes until they become pulpy, strain, and combine with the cheese, cream, and pepper. Pour this over the cucumbers and bake in a hot oven (450 degrees F.) for 15 to 20 minutes. Just before serving, sprinkle with a tablespoon of chopped parsley and mint.

Tomato Cups

4 to 6 large tomatoes
1 small cucumber (peeled and diced)
1 clove of garlic
½ onion (finely chopped)
½ oz. of butter
Half a rasher of bacon (finely chopped)
3 teaspoons of flour
¼ teaspoon of salt
⅛ teaspoon of pepper
4 oz. of cream

(4 to 6 servings)

Cut the tops off and scoop the insides out of the tomatoes, stand upside down to drain, and then season the insides with salt, pepper, and sugar. Saute the onion, bacon, and garlic in the butter, add the flour, ¼ teaspoon of salt, and ⅛ teaspoon of pepper and cook for a minute. Add the diced cucumber and 2 tablespoons of pulp from the tomatoes, and cook a little longer. Finally add the cream and stir until thick. Fill the tomatoes with this mixture, sprinkle the tops with breadcrumbs, and bake in the oven until tender (375 degrees F. for 15 to 20 minutes).

Salmon Cutlets and Cucumber Sauce

This is a rich but delicious recipe.

1 medium tin of salmon
4 oz. of butter
4 oz. of fresh breadcrumbs
2 oz. of cream
Pepper

Soak the breadcrumbs in cream, soften the butter and mix with the salmon, combine all the ingredients, and then put on to a heavily floured board and form into a long roll. (The mixture is soft to handle.) Place in a refrigerator until firm and then cut in slices about ½ in. thick and fry in butter until golden brown. Put aside to cool and serve cold with the following sauce:

¼ cup of cream
1 tablespoon of vinegar
1 cucumber peeled and grated
Salt and pepper

(Approximately 6 servings)

Have all the ingredients ice cold if possible. Beat the cream until thick but not stiff, then beat in the vinegar, season, and finally fold in the cucumber.

Cucumber Stuffing for Baked Fish

2 rashers of bacon
1 small onion
2 cups of chopped cucumber
1 cup of soft breadcrumbs
1 tablespoon of melted butter
2 eggs, slightly beaten
Salt and pepper

(Yields 3 to 4 cups; sufficient for large fish)

Chop the bacon and onion, saute for a few minutes, add the remaining ingredients, and mix well.

Cucumber Garnishes

Cucumbers can make very attractive finishes for fish dishes and salads. The instructions for making the garnishes illustrated above are as follows:

Cucumber cones: Cut and remove a small triangular piece out from the slice. Wrap one cut edge over the other to form a cone. Secure with a toothpick if necessary.

Crimped cucumber: Peel the amount of cucumber that is required, then score with a fork lengthwise. Cut slices to the thickness required.

Deckle edge: Remove lengthwise strips of peel ⅛ in. wide and ½ in. apart. Then slice the cucumber.

Photographs by Sparrow.

Cyclamen in Homes and Gardens

CYCLAMEN are extremely popular pot plants and excellent cut flowers which give much pleasure with their bright flowers during winter. They are mainly grown inside or under glass in the south, but they can be grown equally well outside in the north. This article outlines their requirements and discusses the various ways in which they can be grown.

By K. H. MARCUSSEN,
Horticulturist,
Department of Agriculture,
Christchurch

THE cyclamen commonly grown as pot plants are derived from *Cyclamen persicum*, but there are other cultivated species which are seen occasionally, mainly in rock gardens; the best known is *C. neapolitanum*, which starts to produce its small, dainty flowers before the leaves appear.

Cyclamen originate from the Mediterranean region. They are found in semi-shaded, damp situations where drainage is good. Many New Zealand soldiers will remember seeing *C. neapolitanum* flowering prolifically under shrubby growth in the gullies between olive groves in southern Italy.

The conditions under which cyclamen grow in their native habitat should be considered, as only by giving them somewhat similar environment can success be achieved.

Commercially, cyclamen are raised from seed every year, but they can be grown on for a number of years if the tubers are well cared for. In general, however, the best flowers are obtained during the first year of flowering when the plants are raised from seed.

Raising from Seed

Cyclamen seed is expensive, but it is essential to start off with a first-class strain; otherwise really good plants cannot be expected. Specialist seed growers keep specific strains and select only the best plants for seed growing. Cyclamen seed is sold by number, not by weight. Germination varies with the quality of the seed and the manner in which it has been stored, but it is usually between 65 and 80 per cent.

Cyclamen are winter flowering and the time of sowing the seed does not materially affect the time of flowering, but it greatly influences the size of plants. Seed is usually sown from 9 to 15 months before the plants are required to begin flowering; the longer period usually producing larger plants with a greater ability to flower.

Soil mixtures for cyclamen should always be very open, similar in type to that in their native woodland. Leaf mould should preferably be incorporated to give the soil the correct texture.

John Innes seed compost is suitable for raising the seedlings, but if it is intended to leave the plants for long in the seed boxes, it will be preferable to use John Innes potting compost. These mixtures are made up from the following:

John Innes Seed Compost

2 parts (by volume) of loam
1 part (by volume) of leaf mould
1 part (by volume) of coarse sand

For each bushel add 1½ oz. of superphosphate and ¾ oz. of lime (an apple case contains about 1 bushel).

John Innes Potting Compost

7 parts (by volume) of loam
3 parts (by volume) of leaf mould
2 parts (by volume) of coarse sand

For each bushel add 1½ oz. of dried blood, 1½ oz. of superphosphate, ¾oz. of sulphate of potash, and ¾ oz. of lime.

The loam and leaf mould should be disinfected before use to ensure that it is free from pests and disease organisms; details of this are given in Bulletin No. 363, "Disinfection of Nursery Soil", available free from the nearest office of the Department of Agriculture.

It is best to plant the seeds individually in boxes or pots filled firmly with well moistened soil. The seeds should be spaced 1 in. apart and planted ¼ in. deep. The soil should never be allowed to dry out, and to conserve moisture a sheet of glass can be kept on top of the box until germination takes place.

Germination is rather slow. The seeds will plump up and develop roots in about 2 weeks, but the first leaf will not develop until 5 to 8 weeks have passed.

The soaking of seed in tepid water for 36 hours before sowing is claimed to give germination in 3 weeks.

Care of the Seedlings

The aim should be to produce squat, bushy plants and to achieve this they must be placed in good light as soon as germination begins; but strong sunlight should be avoided or leaf damage may result.

If the seeds have been spaced an inch apart, and especially when John Innes potting compost has been used, early transplanting is not necessary. Provided their growth is satisfactory, they can be left in the seed boxes or pots until the leaves of adjacent plants are touching. Then, however, they should be transplanted immediately or lanky growth will develop. Once long leafstalks have started to form it is very difficult to bring the plants back to a compact form.

The plants should be kept reasonably moist, but the soil must not be too wet. A light sprinkling with a hose or watering can is beneficial on hot days.

Pricking out

When the seedlings have reached sufficient size or their growth appears to have slowed up they should be transplanted into fresh soil. They can be potted up individually in small pots, but it will save space if they are pricked out in boxes; furthermore, management will be easier when they are growing in boxes, especially in regard to watering.

The soil mixture used at this stage should be based on the John Innes potting compost formula.

The plants should be graded when they are being pricked out, so that the largest are grown together. Very weak ones are probably not worth keeping, as they seldom develop satisfactorily. Spacing should be 2 in. both ways for the large plants and slightly less for the smaller.

Small tubers have formed between the roots and the rosette of leaves at this stage; these tubers should just be covered with soil when they are planted. The top of the tuber will then be exposed when the soil has settled; that becomes important later when they grow larger and flatten out.

A good watering should be given after pricking out, but following that the plants should be kept rather dry for a short period. Root movement of cyclamen can be rather sluggish after this shift and a search for moisture will assist the root system to become established in the new soil. Normal watering should be recommenced as soon as the plants again show signs of active growth. The plants should receive as much light as possible, but not be subjected to strong sunshine.

Fine sprinkling of the foliage will be beneficial on warm days; this will also assist in creating a higher humidity which cyclamen like at this stage of growth.

Growing on

Cyclamen raised from seed should be grown slowly and for best results their development must never be checked. They should therefore be moved on to fresh soil and given more space as they develop. The time for a shift is easily determined when they are small and growing in boxes; it can be more difficult to decide if they have been potted up. Plants should be

↓ *Cyclamen neapolitanum* is a colourful autumn flowering plant. Elliott photo.

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taken out of the pot occasionally so that the root development can be examined.

They should at no time be grown close together. The recommendation to keep them spaced so that the leaves from one plant do not touch another should be the rule; otherwise firm, squat plants will not result.

When the plants are touching in the boxes and require their next shift a decision must be made as to the manner in which they are to be grown on.

Potting up and Repotting

If they are to be flowered as pot plants, they should be potted up into 3 or 4 in. pots.

For late sown plants which are intended to be flowered in 5 in. pots the 3 in. pots will suffice in the meantime. The early sown plants, which are grown over a longer period, are better potted into 4 in. pots at this stage; they should grow large enough to require 6 in. pots for their final potting. These sizes of pots for the first potting are chosen because it is best to repot cyclamen into pots which are two sizes larger than the ones they were growing in. They will then get a satisfactory supply of fresh soil, apart from the greater ease of repotting.

Pots should be clean and well crocked, especially the larger sizes, to ensure good drainage. The soil should be moderately firmed round the roots, and must be kept off the top of the tubers.

The soil mixture for 3 and 4 in. pots should be based on the John Innes potting compost formula, but the fertiliser quantities should be doubled for larger pots; that is, John Innes potting compost 2.

The final potting should be done in January to allow the plants to get well established before flowering begins in late autumn.

Growing in Boxes

If the cyclamen are not required as pot plants, for example, where cut flowers only are wanted, they can be grown in boxes instead of pots.

For this purpose 20 lb. fruit cases (measuring 7 x 7 x 18 in.), which each comfortably hold two plants, are sometimes used by commercial growers, but their side boards tend to warp. For home gardens it would be advisable to use heavier timber.

Fruit cases provide adequately the essential drainage without alteration. To prevent soil falling through the slits it is advisable to place a layer of partly decayed organic matter in the bottom. About 2 in. of half-rotted compost would be ideal, as it would also provide plant food when the roots extend to it.

The remainder of the box should be filled with John Innes potting compost 2, into which the small plants should be planted in the same manner as described for potting up.

Cyclamen can be grown in boxes for cut flowers.

Growing in Beds

Cyclamen can, of course, also be grown in beds, both under glass and, in northern districts, in shade houses or outside in a suitable situation.

If it is intended to grow them in beds, the soil should be prepared by adding a good supply of leaf mould, fluffy peat, farmyard manure, or compost, so that the texture will be suitable. An open soil similar to woodland conditions is essential for good root development of cyclamen.

This preparation should be done early enough to make the soil fit for the tender roots. A few weeks will suffice if the material is well rotted, but several months should be allowed where fresh manure or half-rotted compost is used.

The quantity required will vary with the soil type, texture, and the amount of humus already in the soil, but it is better to apply it generously.

The following should be applied to each square yard of the bed before planting and worked into the top 6 in. of the soil:

3 oz. of dried blood
3 oz. of superphosphate
1½ oz. of sulphate of potash
1½ oz. of lime

The plants should be planted as described under potting up and spaced at least 8 in. apart.

General Requirements

Cyclamen are not hothouse plants and too high temperatures are detrimental. They cannot be forced like many other plants, but should be kept growing steadily from germination of the seed until they flower. Their growth should never be checked and moderate temperatures without great variations should be maintained.

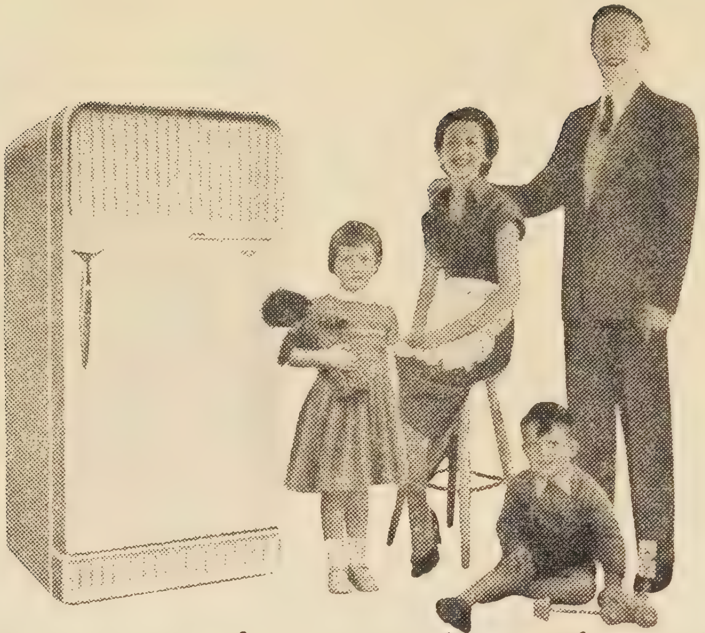
During the first winter they should be kept at 55 degrees F., if possible, as they will develop steadily at this temperature. They can be grown under cooler conditions, but growth will be slowed down correspondingly. During spring and summer when the light is stronger the temperature can be raised to 60 degrees F., but when they come into flower in autumn they should be kept at 50 degrees F. or even below.

Seedlings raised in late summer, autumn, or winter should be kept under glass until early summer. They can be kept in a glasshouse during summer if adequate ventilation can be given, but for home gardeners they will probably be better if shifted into a shade house or a frame for the hot season.

Glasshouses should be shaded during summer, but in frames during summer the glass covers should be removed and scrim covers substituted. Such covers should be kept on only during sunshine; on dull days and at night they should be removed to harden the plants.

Plants in pots or boxes can be placed outside in summer in a suitable position. They should be sheltered from strong winds and shaded from the sun during the middle of the day. Pots should be sunk into the ground almost to their rims to conserve moisture and prevent their falling over.

Cyclamen can also be planted out in beds as described earlier. A position



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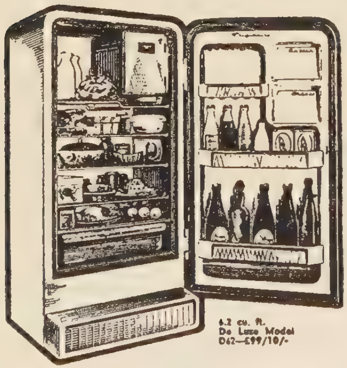

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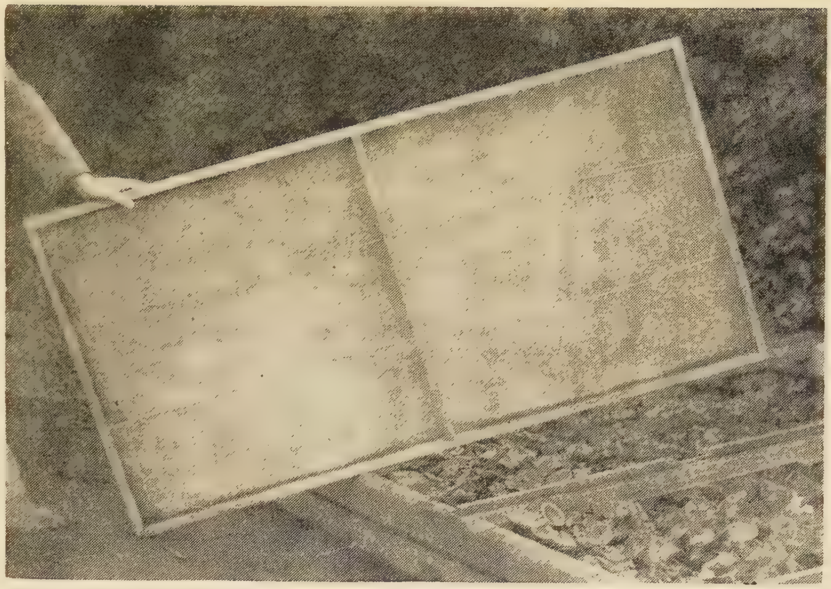


[Campbell

Scrim covers are valuable for shading plants in frames during summer, but should be removed on dull days and at nights.

under trees to give shade when the sun is high in the sky but to allow for full light when the sun is at a lower angle would be the ideal. Cyclamen must be classified as half hardy; they can be grown in sheltered positions as far south as Dunedin and have been known to withstand 8 degrees of frost when growing outside.

Humidity should be maintained in relation to temperature and light intensity. It should be high on warm, sunny days, when sprinkling of the plants and their surroundings will be beneficial, but kept drier when it is dull and cold. This is especially important in winter when the plants are large and in flower, as excessive humidity will assist development of the fungous disease to which cyclamen are subject.

The soil in which cyclamen are growing should never be allowed to become dry, except, as mentioned earlier, for a short period just after the seedlings have been pricked out. But watering can be overdone. The rate of watering must be regulated to the extent of growth and the temperatures. Cyclamen will require fairly frequent watering in summer, but should be kept somewhat dry in winter, particularly flowering plants kept in a cool room.

A good soaking should be given when the plants need it, but they should then be left until water is again required. Care should be taken that the tops of the tubers are kept dry, especially in winter.

The importance of adequate spacing for the development of squat plants has already been stressed. Good spacing will facilitate circulation of air between the plants and good ventilation is a deterrent to the spread and growth of disease organisms. Furthermore, good spacing enables the grower to watch the plants more easily.

Leaves dry off from time to time and must be removed. They should be plucked off at the base rather than cut off, as remaining stumps may decay, and the rot, which is generally caused by botrytis, may enter the tuber if conditions are suitable. Flower stalks should be removed in the same manner.

Major commercial growers overseas examine cyclamen in pots every few weeks, remove any dying or diseased leaves and flowers, and space them as required.

Feeding

Cyclamen grown in a suitable soil mixture containing the recommended fertilisers should not need supplementary plant food until some 6 to 8 weeks after they have been placed in fresh soil. From then on, however, they require further nourishment, mainly nitrogenous. Dried blood is suitable and can be applied at 1 oz. to 1 gallon of water. It should be kept agitated, as it is generally not very soluble. Applications can be made weekly or fortnightly according to the amount of water the plants receive.

Treatment of Old Plants

By raising cyclamen from seed every year it is possible to grow fairly uniform plants. That, of course, is the aim of commercial producers, but home gardeners are sometimes successful in bringing old plants into flower year after year.

If that is intended, water should be withheld gradually when flowering has ended in spring. The plants should be kept shaded and fairly dry during early summer, but they should not be lifted or taken out of the pots and dried off like most bulbs or corms. They can be placed outside in the pots or heeled in. Most of the leaves will turn yellow and dry off; they should then be carefully removed so that the skins of the tubers are not damaged.

The plants should be potted up or planted out in fresh soil in January. Dead roots should be removed and any long and straggling ones cut back; they should never be pulled off.

The plants should be started off by gradually increased watering and humidity, and in general be given the same treatment as outlined for younger plants approaching the flowering season.

Care of Flowering Plants

Flowering cyclamen plants are popular for home decoration. Provided they have been growing in cool conditions in the glasshouse, they should flower for several months when given the right conditions.

They should be kept in a position where the light is good, but not exposed to continuous sunshine, such as might be the case in the sill of a window facing north. Nor should they be placed near heaters, where the atmosphere tends to become too dry. Great temperature changes should be avoided as should draughts.

In common with other plants cyclamen will not tolerate gas leaking from faulty pipes or taps.

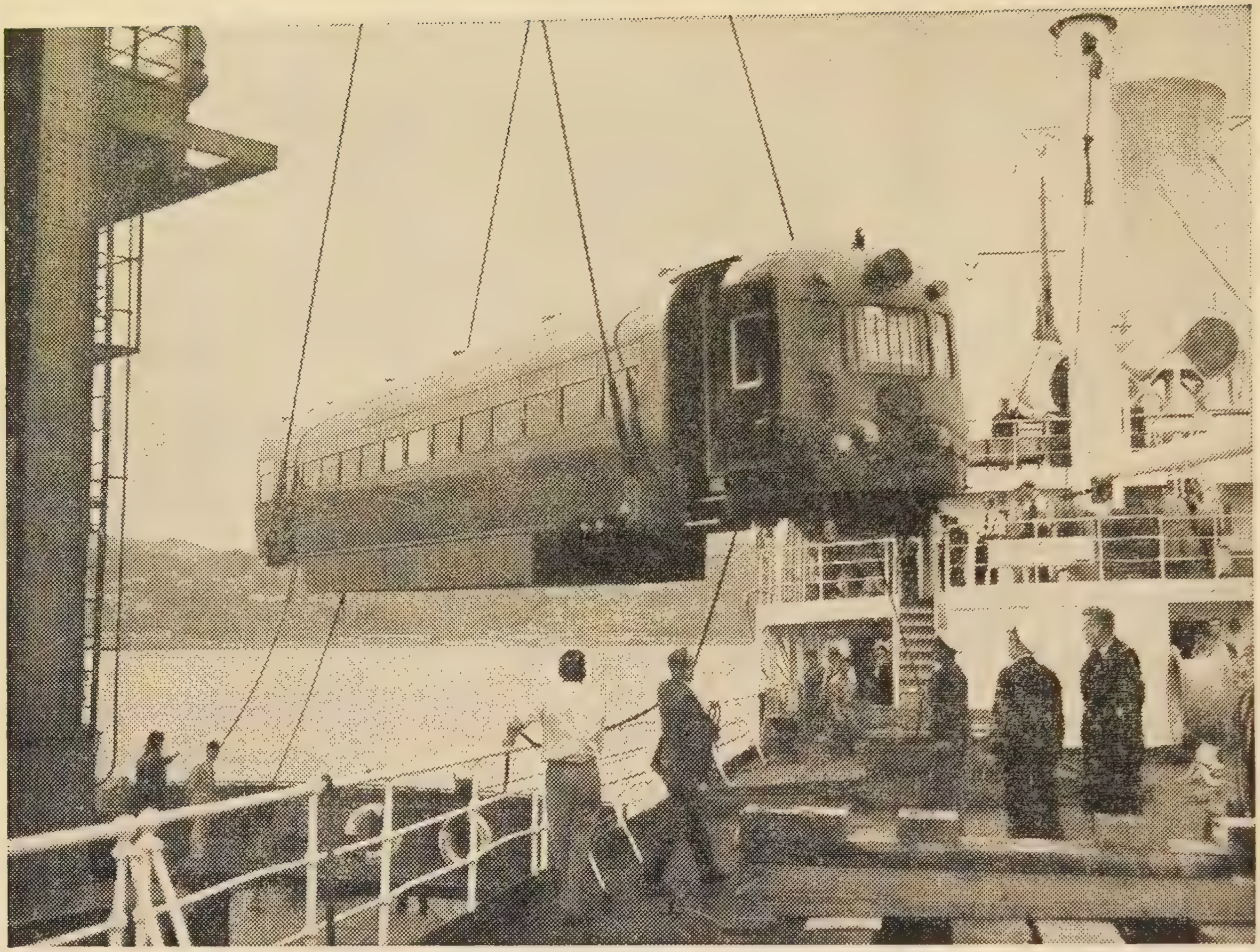
Watering must be attended to with care and must never be overdone. Its frequency will depend on the temperature of the room and the size of the pot and of the plant. A large plant may sometimes require water daily, if kept in a warm, well lighted room, but the same plant may not require water once a week if kept in a poorly lit and cold room.

Temporary loss of freshness of the leaves usually indicates need for watering, but water has probably been given too frequently if this condition is permanent.

When watering, sufficient should be applied to moisten all the soil. However, care should be taken that the top of the corm is kept dry at all times.

Pests and Disease

It is not difficult to grow healthy cyclamen, but various troubles can be encountered. Insect pests can become established even if the plants are well grown, but fungous disease is usually



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If you put too much weight up top a ship will become unstable; might even capsize, if the process is carried to extremes. Put too much weight fore and aft and you run the risk that she will break her back in bad weather. Weight distribution has to be precise. But that is our job; and while the stowage of New Zealand's exports is difficult enough, the problems on imports are even more substantial, because they vary so much more in bulk and weight. Tractors and tinplate, chemicals, cars, all have to be stowed in such a way that they are available in the right sequence at the various ports of discharge. Railway engines and coaches too, have to be specially stowed.

And when you think you've worked out all the answers, there still remains the matter of oil and water.

The ship's requirements of these essential commodities add up to a very considerable amount for each leg of the outward voyage, and both are being constantly consumed. Therefore, the ship that leaves London correctly loaded may be as much as 1,000 tons lighter—and over a foot and a half higher out of the water—when she reaches Curacao, her main bunkering port. And because it is at this moment that a ship will be least stable, calculations for her loading must all be based on it.

It's complicated, to say the least of it, and almost every day of the year somebody, somewhere, is busy with slide rule and computers, working out cargo loadings.

And it is a tribute to the work of people seen and unseen—to the Freight and Traffic Departments and Cargo Superintendents, on the one hand, to the watersiders on the other, and especially to the Masters, Officers and Crews who sail the ships—that cargoes *do* arrive safely, and that the trade by which we live continues to flow.

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The following are the pests and the disease commonly met with and recommendations for preventing or controlling them:

Aphids or **green fly** infest cyclamen quite frequently and should be controlled early. Two or three sprays of nicotine sulphate (1 fl. oz. to 4 gallons of water plus 2 oz. of soft soap as an activator) at 10-day intervals will control this pest, or lindane or malathion may be used at the manufacturers' recommendation.

Mites are sometimes found, but generally only when plants have been grown in a dry atmosphere. Malathion will control them, but the leaves must be sprayed underneath, and several applications at 10- to 14-day intervals may be necessary.

Caterpillars are sometimes troublesome. DDT will control them, except some of the leaf roller caterpillars for which DDD is effective. Malathion gives satisfactory control of all types.

Cyclamen weevil (*Otiorrhynchus sulcatus*) is found as a grub not unlike the grass-grub. It will chew the roots off the tubers, resulting in collapse of the plants.

Disinfection of the soil before potting will kill any grubs present and the addition of DDT in the soil mixture at ½ lb. of 5 per cent dust per bushel will kill any grubs appearing.

Snails and **slugs** are found on cyclamen. They can be killed by the use of metaldehyde used either as a spray or a bait. This material is sold under various trade names.

Grey mould caused by *Botrytis cinerea* is the common disease affecting cyclamen. It becomes troublesome mainly when plants are grown in too moist an atmosphere under cold conditions. Prevention should be by good cultural conditions with special reference to hygiene, adequate spacing, and correct temperatures and humidity. Thiram used as a spray or dust will keep it in check.

▼ Petunias give a prolonged display over late summer if kept well watered and given a boost of fertiliser at this time.

Garden Work for February

Two of the most important tasks for February concern lawns and the propagation of new plants; the latter can prove both a profitable and fascinating hobby.

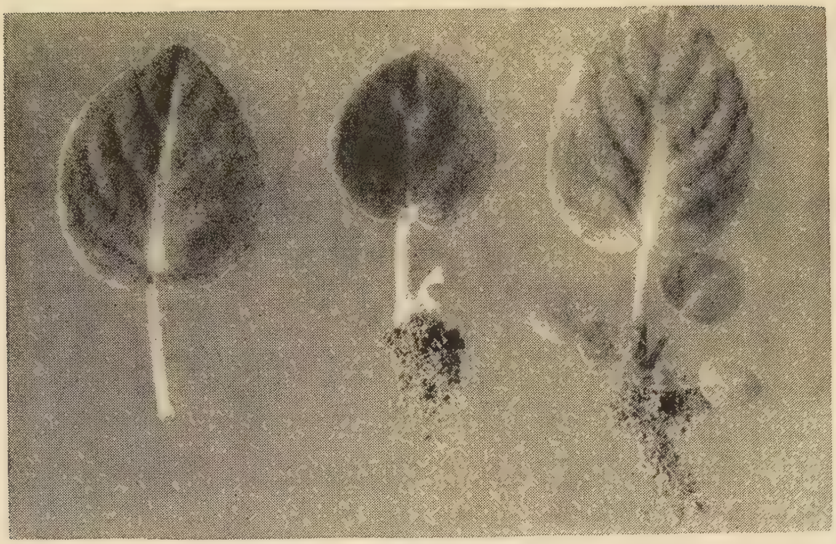
By ROSALIE A. CAMPION,
Horticultural Instructor,
Department of Agriculture,
Wellington

Plants from Cuttings

February is a good month for taking cuttings of many different plants. The gardener's green fingers really amount to the understanding which he has of the needs of a cutting until it is planted out. The first requirement is a medium in which to place the cutting so that is is held upright. This medium should be free draining so that the base of the cutting is not waterlogged; it should, however, hold sufficient moisture to encourage root growth. The atmosphere at the top of the cutting should be humid enough to prevent the leaves from drooping through loss of moisture and yet not so moist as to induce leaf rotting.

Soft foliage is inclined to droop and also to rot and therefore partially matured cuttings of this type placed in a moist and aerated place are best. This type includes geraniums, fuchsias, pentstemons, calceolarias, hydrangeas, lavender, and Siberian wallflower, which can be rooted outside if kept moist and covered with newspaper or placed in partial shade. Cuttings placed to root in pots of sand can be enclosed in a polythene bag which while allowing the free passage of air will prevent loss of moisture. Cuttings about 1 in. long and taken from the inside of erica, boronia, or manuka plants will also root easily this way.

Cuttings which were taken in January should be inspected and kept turgid by watering as required. Those which have rooted could be potted up or planted in a shaded position. The



[*Sparrow*

Saintpaulia ionantha showing the development of shoots from the base of the leaf cutting.

violas which were cut back in January should have produced sturdy shoots suitable for cuttings. Marguerite daisies which have become straggly can be cut back and the shoots can be rooted in a shady position.

Dahlias and Chrysanthemums

Dahlias and chrysanthemums will be starting to give their best display and to maintain this side dressings of a general fertiliser or weak liquid manure can be applied when the ground is moist. Staking should be continued. Green string or raffia is excellent for tying, and stout manuka or bamboo stakes give a natural effect.

If show blooms are required, the side buds should be removed from dahlias. As the chrysanthemum flower heads develop the side shoots should be removed to give a good, clean stem, except on cascade or pompone varieties.

Annuals

Some of the early flowering annuals such as antirrhinums, petunias, stocks, and sweet scabious will give a prolonged blooming if spent flower heads are removed regularly and the beds are kept well watered and given side dressings of a balanced fertiliser. The water supply should be maintained to encourage further growth. Calendulas can be planted where early flowering annuals are finished.

A visit to the local public gardens should reveal some new ideas for summer bedding schemes and some new types of annuals for planting next season.

Seed Sowing

Seed of winter-flowering sweet peas could be sown now in beds which have been enriched with organic matter and where the height of the bed has been raised to give drainage during winter. A pinch of a fungicidal dust such as thiram or copper oxychloride should be dusted into all packets of seed before sowing.

To obtain blooms of Iceland poppies in winter seed should be sown now for planting out into a sheltered position. The seed is very fine and should be very lightly covered.

Seed of calendulas for winter flowering can also be sown. It is generally too late to sow seed of wallflowers this month in expectation of a great display in spring, except in the most favourable conditions. Instead, the plants should be obtained as soon as possible and lined out in the vegetable garden to form bushy plants ready for planting out in April.

Carnations and Pinks

Layers of border carnations, recognised by their bushy habit and smooth-edged flower petals, can still be made. The leaves on the lower part of the stem should be removed and a shallow slanting cut can be made to induce rooting. This cut can be kept open by the insertion of a piece of twig. The soil below the layer should be prepared by the addition of a little sand and compost. The lower stem should be placed in a hollow and covered with the mixture. The layer may be pegged down with wire or a stone may be placed above the soil to keep it in position.

Cuttings of pinks and perpetual flowering carnations such as Rose Clove and Frank Aldritt (Otaki Pink) can now be rooted in sand. Perpetual plants from which winter blooms are desired should be stopped early this month by breaking the tips off the young stems.

If the flower petals appear bleached and malformed, this is probably the result of attack by thrips. Sprays of DDT emulsion should be used regularly when these pests are troublesome.

Lawns

The preparation of new lawn sites should continue. This is the best time to remove perennial weeds. When the area has been levelled it should be consolidated by tramping heavily and systematically over it with the heels. Heeling and raking in at least two directions will reveal and rectify any unevenness. Annual weeds which appear after rain should be killed by shallow hoeing.

Subterranean caterpillars of the porina moth and grass-grubs can quickly damage lawns and DDT dust should be applied regularly every second year at 1 oz. of 50 per cent DDT to 40 sq. yds. This can most easily be applied with the regular 3 monthly fertiliser dressing as mentioned last month.

Roses

The climbing rose Lorraine Lee which flowers on through winter in the warmer districts can be pruned now by removing old, straggly, or diseased portions. This variety will root from cuttings taken now. The cuttings should be 5 in. long and placed in a shaded position or covered to prevent flagging. Cuttings of other rose varieties including Peace, Cecil Brunner, and Crimson Glory will also root from cuttings. The budding of roses should be continued.

Rambler roses should be pruned by the removal of wood which has flowered.

Pests and Diseases

Many pests are prevalent at this time of year and spraying or dusting is generally necessary to protect growth.

Caterpillars and **pear slug:** Use malathion, lindane, arsenate of lead, or DDT.

Thrips and **rhododendron lacebug:** Use DDT emulsion.

Aphids: Use malathion, lindane, or nicotine sulphate. Do not use emulsion type of sprays on roses.

Green vegetable bug: Use DDT, lindane, or malathion.

Scale insects: Use summer oil.

Mealy bugs: Use summer oil or malathion.

Red spider mite: Use malathion.

Grass-grubs: Use DDT.

Leaf miners: Use lindane emulsion.

Where leaf spotting has occurred sprays of thiram, zineb, sulphur, or copper oxychloride should be used to prevent further spread of infection. If mildews have appeared, sprays of sulphur should be applied.

Bulbs for Early Planting

Toward the end of the month bulb planting can be started. The smaller

Marguerite daisies grown from cuttings taken now will make a bright splash of colour all the year round in relatively frost-free areas.

tubers of anemone generally are better than the larger ones for early planting, and if a warm, sheltered position is available, a few of these and of ranunculus could be planted 12 in. apart for late winter flowering. The soil should be enriched with well rotted compost and dusted liberally with a mixture of equal parts of blood and bone and of superphosphate before planting the bulbs 2 in. deep.

Freesias, grape hyacinths, and bulbous iris, including *Iris reticulata*, can also be planted where space is available. The use of bone meal or bone dust at 4 oz. per sq. yd. will supply their fertiliser requirements.

Bulbs in Bowls

The flowering of bulbs in bowls can be an interesting feature in a room for a long period during winter. Hyacinths are one of the best types, but many others including crocus, chionodoxa, *Fritillaria meleagris*, galanthus (snowdrops), narcissi, and tulips can be satisfactorily grown. The best effect is usually achieved by planting one variety in each bowl, but if a very large bowl is being used, the bulbs can be grouped according to heights and colours.

The cleanest and easiest material in which to plant the bulbs is the prepared bulb fibre available in most seedshops. When this fibre is used it is desirable to have a non-porous container to prevent excessive drying out. The bulbs should be planted closely but not touching and with the tops showing through the fibre.

When a bulb has been planted and watered the container should be placed for the next 6 weeks in a cool, dark place to encourage rooting before the foliage appears. Burying in the garden or in a box of moist sawdust on the cool side of the house would be satisfactory.

Cyclamen

Cyclamen corms which have been resting over the summer in a cool position should be knocked out of their pots now and repotted. A potting compost can be made from

7 parts of turfy loam,

3 parts of leaf mould or peat or well rotted compost,

2 parts of sharp gritty sand

to which 4 oz. of balanced fertiliser mixture and ¾ oz. of lime per bushel (about an apple case) have been added. The corms can be potted into a 4 in. pot and later transferred to a 5 in. pot as the roots develop. Over the drainage hole of the pot an inverted piece of broken pot can be placed. Above this a layer of sphagnum moss or coarse leaf mould can be placed to assist drainage further. With the corm held in one hand at a height judged so that the corm will finally sit on the soil level, the compost should be mixed firmly among the old roots to anchor the corm until the new roots develop. The pot should then be watered and placed in a cool, moist position.

Glasshouse Tasks

Cinerarias and primulas for winter flowering can be potted up with the same mixture as recommended above for cyclamen. When watering these plants care should be taken to avoid water lodging between the leaves, as rotting may occur.

The surface soil of pot plants which have been continually watered over summer should be scarified to aerate the top of the soil. A light topdressing of humus could be given and also a balanced liquid fertiliser.

Rex begonias can be propagated at this time by laying one of their ornamental leaves on the top of moist sand in a closed frame. The veins of the leaf should be cut in several places, from which new shoots will later appear. The leaf can be anchored by placing a little sand on the edges.

The South African violets (*Saintpaulia ionantha*) can be propagated readily by leaf cuttings. The petiole and base of the leaf should be inserted in sand until new shoots appear from the base.

The floor of the glasshouse should be damped down several times each day to maintain a humid atmosphere. On the warmest nights the ventilators can be left partially open to prevent excessive temperature build-up and give free circulation of air.

Pelargoniums which have flowered well in the house are now becoming straggly and should be cut back before placing outside for a period. Another attractive flowering plant which is useful in the glasshouse is schizanthus, seed of which can now be sown.

General

Many hedges including *Cupressus macrocarpa* should be cut again to keep them neat. The soft young clippings can be composted.

In the border, staking should be continued and dead flower heads should be removed regularly. In larger gardens the clothes basket is handy for taking them to the compost bin. The compost bin should be developing well and when it is full it should be left for 2 to 3 weeks to decompose partially before turning it all into the next bin. Sawdust is a useful cover, but a dusting of blood and bone should also be given at the same time. If flies are present, DDT dust should be used liberally. Lime should be used very sparingly in the flower garden, but if the heap smells rather sour, a light dusting should be used when turning.

Gladiolus which flowered at Christmas can now be lifted and placed in boxes in an airy position until thoroughly dried. Growing plants of gladiolus should be inspected for thrips, which give a pale, streaky, and malformed appearance to leaves and flowers.

The control of oxalis in vacant areas should be carried out, as mentioned last month.

The planting of bearded iris should be concluded as soon as possible. Lilies can be transplanted as soon as the flowers fade. The varieties which have streaks or distortion caused by virus disease should be dug up and burnt.

A Useful Plastic Skirt

By ELEANOR S. CAMPBELL,
Home Science Instructor, Department of Agriculture,
Auckland

A CIRCULAR skirt of plastic material would be a most useful addition to any woman's wardrobe, and such a skirt can be easily made from the instructions given in this article. If made large enough to slip over the top of a dress or suit, it will protect the clothes from getting soiled. As it would be water repellant, a plastic skirt would be useful in showery weather for cycling, gardening, or playing golf.

MATERIALS required are 2½ yds. of 48 in. material, ¼ yd. of taped domes, and 1 reel of mercerised cotton.

The skirt is very simply made in a semi-circle. It should have a good overlap to ensure that it covers the clothes underneath, and for this the waistline must be made 6 to 8 in. larger than normal measurements. This can be done quite easily as shown in the diagram below.

Marking the Pattern

Fold the material in half. The distance from A to B will give one-third the total waist measurement. The 12 in. shown on the diagram will give a waist measurement of 36 in. Draw or mark an even line from B to C with a radius of 12 in. or whatever measurement is desired, remembering that the radius multiplied by three gives the length of the waist. The length of the skirt can be decided by measuring the distance between B and D and drawing a half-circle from D to H, using the distance A to D as the radius. In the diagram the skirt would be 30 in. long.

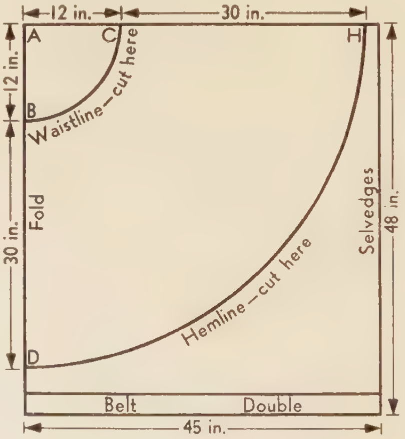
[*Sparrow*

As the belt has 6 to 9 in. of domes, the skirt will fit many different waist sizes.

The pattern can be drawn first on a large piece of paper and this used as a pattern for the plastic, but probably a pencil mark could be made straight on to a light-coloured plastic and the material cut without a paper pattern. All that is required are the two semi-circular cuts B-C and D-H. A straight belt 4 in. wide and 38 in. long can be cut from the material left.

Sewing

Pin the belt to the waistline right sides together, turn in the ends to form a neat edge. Stitch the ends neatly and stitch the belt to the skirt. For extra strength a strip of cotton interlining may be placed on top of the belt and stitched flat. Turn under the free edge of the belt, bring over, and stitch to the inside waistline. Stitch the two ends. Now neatly machine stitch one side of the taped domes on the inside of the right-hand front of the belt, and the corresponding half of the domes on the outside of the left-hand front. The skirt is now finished.



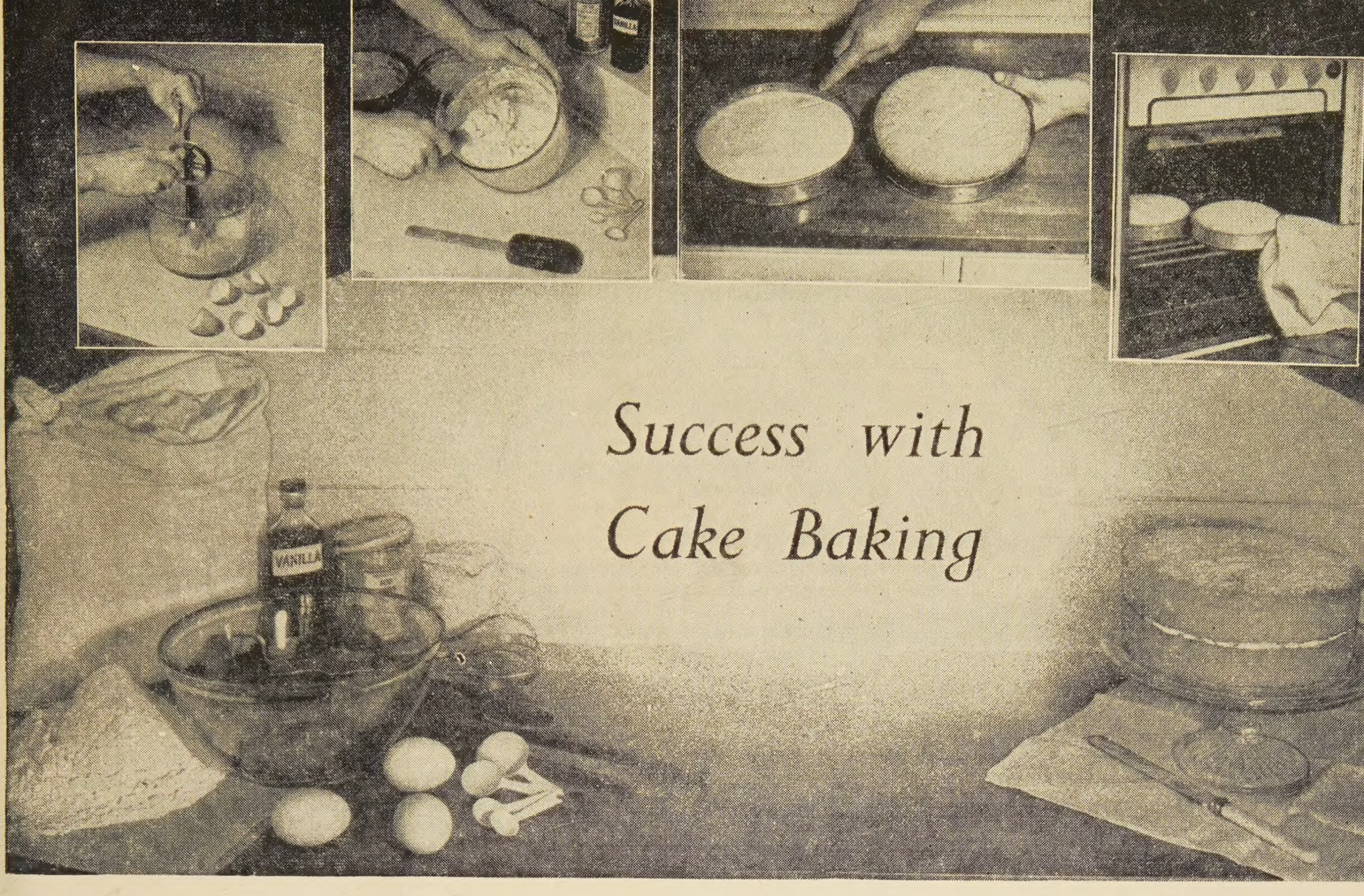
If the waistline is several inches larger than necessary, there is a good overlap to give protection to clothes worn underneath the skirt, and as the belt has 6 to 9 in. of domes, the skirt will fit many different waist sizes.

Quite good machining of plastic film can be obtained if

1. A very sharp needle is used.
2. Mercerised cotton is used. (Nylon thread should not be used.)
3. A fairly long stitch length is adjusted.
4. Tension is not too tight.

A cotton interlining in the belt will help also, as cotton does not tend to stretch as does the plastic.

Materials suitable for this skirt are plastics or plastic-coated cottons.



Success with Cake Baking

By JUDITH FERRIER,

Home Science Instructor, Department of Agriculture, Christchurch

CAKE baking is a true art, but proficiency can be attained with practice. Even though great care may be taken during mixing and baking, unless attention is paid to the less interesting details of tin preparation and treatment of the cake after its removal from the oven, the final result will not be perfect.

BEFORE mixing begins place the oven trays in position, according to the oven chart or what previous experience has shown satisfactory, and pre-heat the oven, allowing adequate time for it to reach the required temperature.

Preparation of Baking Tins

Tins are prepared according to the type of cake which is to be baked in them.

Buttercakes

For buttercakes cut a piece of greaseproof paper (which must be lightly greased) or a piece of waxed paper to fit the base of the tin.

Sponge Cakes

For sponge cakes the older method was to grease and flour the tins, which is still satisfactory, but now it is recommended that sponges be either baked in an ungreased tin, or, to facilitate removal of the cake after cooling, in a tin lined on the bottom with waxed paper.

The tins for both buttercakes and true sponges should be left ungreased at the sides so that the batter as it rises can cling to the sides of the tin for support. For this reason circular tube tins are very satisfactory because the rising cake has a greater surface area to support it.

Rich Cake Mixtures

Fruit cakes, which must be in the oven for such a long time, require well lined tins to protect them against burning, and very heavy brown paper is recommended for this. Cut three pieces of paper to fit the bottom of the tin, or, for a very good distribution of heat, aluminium foil, cut to shape, may be substituted for one layer of paper. For the sides use two strips of paper, allowing a good overlap at the join and making each strip 2 in. deeper than the tin. With kitchen scissors snip diagonally along one long edge at fairly close intervals to a depth of about ½ in., so that when in position the strips will fit firmly against the sides.

Place two layers of paper in the bottom of the tin. If foil is used in place of one layer, it should be on top. Next, with the snipped edges downward, fit the long strips closely up against the sides, making sure that they are creased well into the corners of a square tin to give a true, square outline to the cake. Finally, cover the uneven, snipped edge with the third layer of paper for the bottom of the tin, ensuring that it is even; this is necessary for a smooth undersurface to the cake. There should be no wrinkles or creases in the paper lining.

At this stage all weighing, measuring, and sifting should be done so that the actual mixing time is as short as possible.

Tins should be no more than two-thirds full of the uncooked mixture. Otherwise, especially with sponge cakes, as the mixture rises it may spread over the rim of the tin, forming a ridge which would cause the cake to lose marks if it were shown in competition.

BAKING A CAKE . . .

Oven Management

In the oven tins should be placed to allow free circulation of air and not directly one above another when two shelves are in use. If necessary, their position may be changed three-quarter way through the baking time so that they will be similarly baked and browned.

Check a few minutes before it is time to remove the cake so that if it is becoming too brown it may be covered with a piece of greaseproof paper to prevent further darkening on top. When, according to the clock, the cake should be done it may be safely tested not by plunging a cold knife or skewer into its centre, but by inserting a toothpick, warmed skewer, or steel knitting needle gently into the middle. This will come out clean if the cake is ready, and there will be no sound if the cake is held to the ear for a second or two.

A buttercake will shrink and leave the sides of the tin more than a sponge cake, which will shrink only slightly and be a very delicate brown when properly cooked. Both types when done, if pressed lightly with the forefinger, will spring back into their original shape when the pressure is released. Once a cake is cooked, "a few moments longer for good measure" will toughen and spoil rather than improve it.

Buttercakes

When buttercakes have just been taken from the oven they are very soft and fragile; when they are cold they set firmly, so that it is advisable to allow the cakes to cool partially in the tin for 5 to 15 minutes, according to size, because as the cell walls set, the cake derives support from the tin and may be turned out in a good shape. If it is turned out immediately it is taken from the oven, it will fall because the cell walls have not set enough to support the weight of the cake.

Conversely, if the cake is left for too long before it is turned out, the structure will have set firmly, making it difficult to turn the cake out without crumbling and breaking it.

True Sponge Cakes

Like buttercakes, true sponge cakes are very delicate while hot and moist, the cell walls not being firm enough to support the cake, which will fall if it is turned out at this stage.

Therefore, sponge cakes should be allowed to cool in the tin, which is inverted on to a cake rack with the cake, in effect, "hanging" in the tin. If this is done, the shrinkage characteristic of egg cakes as they cool will be kept to a minimum. Marking of the cake surface by the wire of the cooling rack can be prevented if one edge of the cake tin is supported on a knife or matchbox.

The cake structure is firm when cold and the sponge may be removed from the tin ready for decorating and filling.

Rich Cakes

A rich cake can be tested by inserting a warmed steel knitting needle or skewer into its centre; if the skewer, when removed, is clean and free from any trace of stickiness, the cake is cooked. Allow the cake to cool completely or to become almost cold and firm before removing it from the tin, as there will be less danger of breaking it.

To allow the rich characteristic flavour to develop fully it is recommended that the cake be wrapped in greaseproof paper and stored in a suitable tin for about a month before it is iced and decorated just before it is needed.

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Drying Herbs and Flavourings for Out-of-season Use

PARSLEY, mint, and celery are invaluable for adding flavour to savoury dishes. To overcome shortage of supplies at certain times, leaves can be easily dried (as described below) when fresh supplies are plentiful.

Parsley

Wash the parsley, remove the thick stalks, and place the leaves in a piece of muslin. Either plunge the leaves into boiling water or place them in a very hot oven (400 degrees F.) for 1 minute and then continue drying in a cool oven (about 120 degrees F.) until crisp. Heating in a hot oven or blanching for a short time helps to give a better colour.

Mint

Dried mint is useful both for adding to gravies which are to be served with lamb or mutton and for making mint sauce. Use the same method as for parsley, but increase the blanching time to 1½ minutes.

Celery

Celery leaves can also be dried by the same method as used for parsley. The dried leaves are extremely good for adding flavour to soups, stews, and fish dishes.

Storing

When the leaves are thoroughly dried crush them and rub through a fine sieve. Store in small screw-top jars (dark glass jars are best) and leave in a cool place.

—CHRISTINE LYONS,

formerly Home Science Instructor, Department of Agriculture, Auckland

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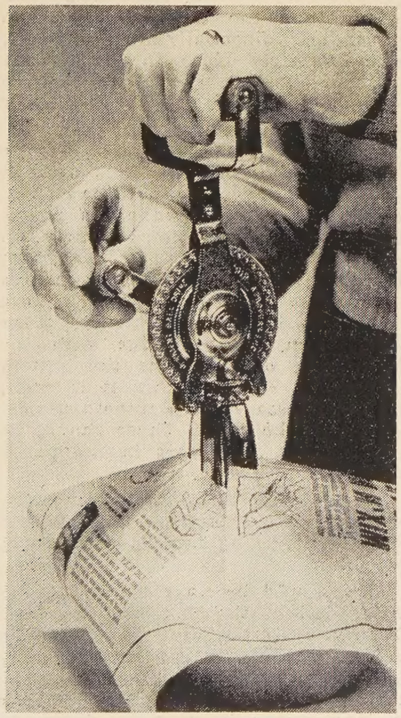

[*Campbell*

Whipped Cream Without Spatter

THE whipping of cream usually causes small spots of cream to be spattered over an area of a foot or two all round the basin. Standing the basin in the sink is one way of avoiding this, but is not always convenient.

This spattering can be prevented by covering the basin with a sheet of waxed paper in the centre of which a hole has been cut to fit round the top of the vanes of the beater. A straight cut from this hole to the edge of the paper enables the paper to be fitted in position easily. If the cut edges are overlapped and pinned, the cream can be beaten without leaving any grease spots to be cleaned up afterward.

—*MAUD B. STRAIN,*

Home Science Instructor,
Department of Agriculture,
Dunedin

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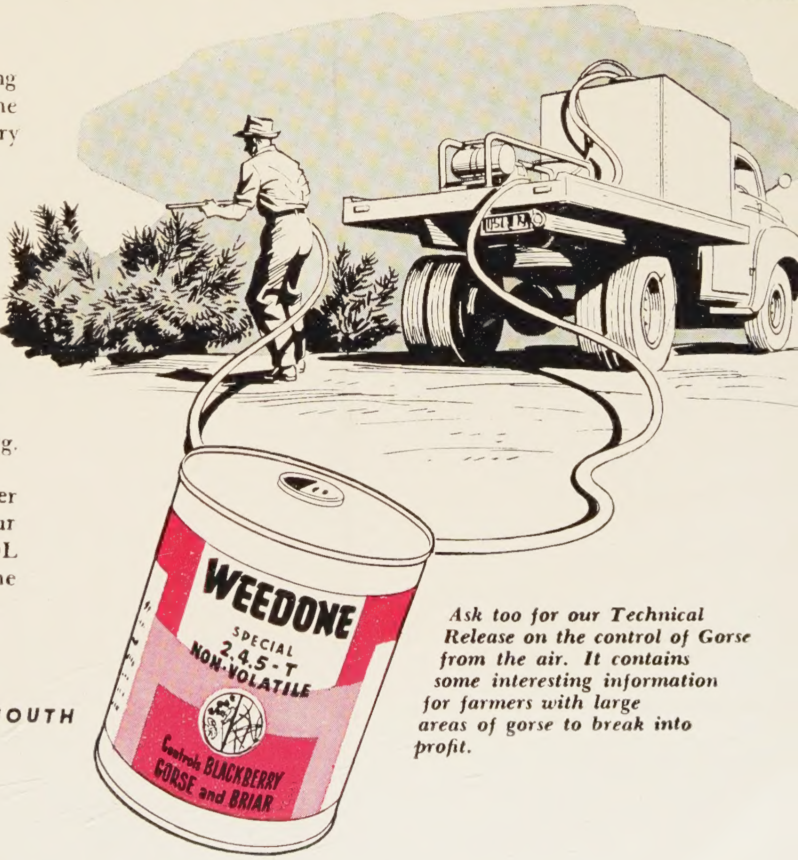
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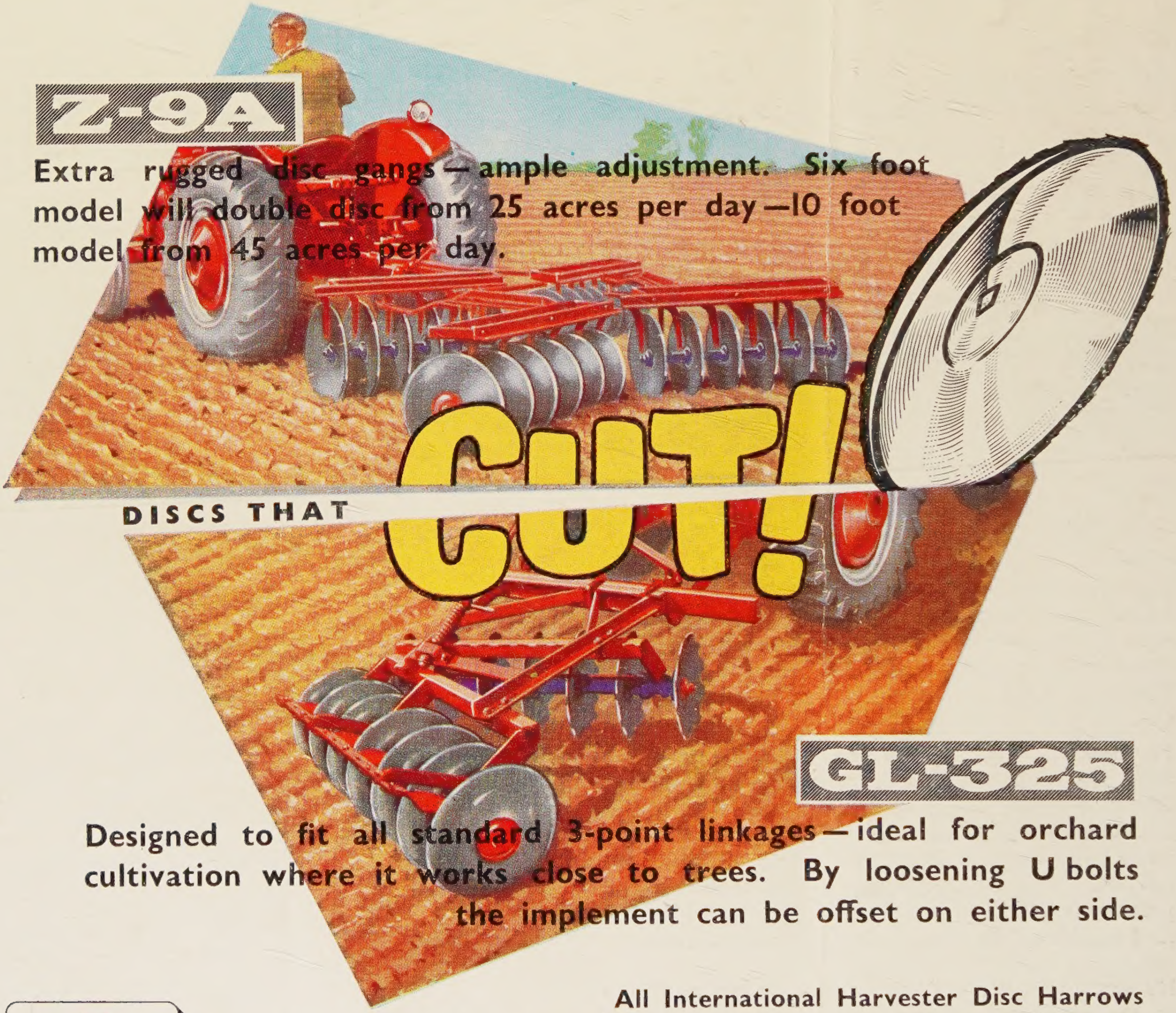

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